Long term proposal Terry

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April 19, 1996

Frank Hawkins
Chairman, U.S. Executive Committee, JCCRER
Director
Office of International Health Studies
EH-63, 270 CC
U. S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Hawkins:

Enclosed please find our proposal for the "Plan for Long-term Russian-American Collaborative Epidemiologic Program: Stochastic Effects of Environmental Radiation Exposure in Populations Living Near the Mayak Industrial Association," to be conducted under the auspices of the agreement on radiation effects between the U.S. and the Russian Federation. We are submitting this for review by the Executive Committee and the Scientific Review Group. If you have any questions about the proposal, please feel free to contact me.

Sincerely,

Terry L. Thomas, M.S., Ph.D.
U.S. Leader, Project 1.2
Associate Professor and Director
Division of Epidemiology and Biostatistics

cc: Dr. Kossenko, URCRM
Dr. Hoffman, GWU

Plan for Long-term Russian-American Collaborative Epidemiologic Program
Stochastic Effects of Environmental Radiation Exposure in Populations Living Near the Mayak Industrial Association

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Plan for Long-term Russian-American Collaborative Epidemiologic Program
Stochastic Effects of Environmental Radiation Exposure in Populations Living Near the Mayak Industrial Association

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Abstract

Under the auspices of the "Agreement on Cooperation in Research on Radiation Effects for the Purpose of Minimization of Consequences of Radioactive Contamination on Health and the Environment" signed on January 14, 1994 by the governments of the United States and the Russian Federation, U.S. and Russian scientists will conduct joint collaborative environmental and epidemiologic research. The operation of the Mayak Industrial Association in the South Ural mountains resulted in prolonged exposures to populations living in areas affected by normal plant operations and by releases from accidents. One of the projects approved under the Agreement was the development of a long-term collaborative epidemiologic program to study populations exposed to environmental contamination resulting from Mayak operations.

The proposed program will evaluate mortality and cancer morbidity among persons living in the vicinity of the Techa River and the East Ural Radioactive Trace, and will lay the groundwork for continued follow-up and future collaborative studies of these unique cohorts. Several tasks are proposed as feasibility efforts to develop procedures for vital status follow-up, to determine completeness of information, to identify appropriate comparison populations, and to validate cancer diagnoses. The Ural Research Center for Radiation Medicine (URCRM) has assembled a well-organized data base for the purposes of conducting epidemiologic studies of radiation-related health risks under the unique conditions of chronic exposure in the South Urals at a wide range of doses. This data base will form the basis for the proposed investigation. Limitations are that follow-up is complete only through 1983 for most of the study subjects, a large number of subjects are lost to follow-up, and appropriate comparison cohorts have not been identified.

The East Ural Radioactive Trace (EURT) cohort is composed of residents of Chelyabinsk Oblast who lived in areas contaminated after a 1957 accident at Mayak. The proposed collaborative effort will verify completeness of the cohort, trace lost to follow-up, determine the feasibility of obtaining cancer morbidity information, determine the best approach for calculating doses for the cohort, and determine the feasibility of identifying an unexposed comparison population. The Techa River cohort includes persons residing in villages adjacent to the Techa River downstream from the Mayak production plant who were exposed to routine discharges from the plant during the period 1950 through 1952. The present study will complement an ongoing project being conducted by the National Cancer Institute, which is limited to an evaluation of cancer mortality through 1992. A long-term collaborative epidemiologic program will be developed to continue follow-up of the Techa River Cohort beyond 1992, to determine the completeness and validate cancer morbidity information and to evaluate mortality from non-cancer health outcomes. Continued follow-up procedures and data analysis plans will be prepared for both projects based on success of pilot efforts.

I. Introduction

On January 14, 1994, the Government of the United States and the Government of the Russian Federation signed the "Agreement on Cooperation in Research on Radiation Effects for the Purpose of Minimization of Consequences of Radioactive Contamination on Health and the Environment". Under the auspices of this agreement, U.S. and Russian scientists will conduct joint collaborative environmental and epidemiologic research. Under the terms of the agreement the Joint Coordinating Committee for Radiation Effects Research (JCCRER) was formed to implement the Program of Cooperation. At the first annual meeting of the JCCRER held October 24-25, 1994, three primary areas of cooperation identified were 1) Medical Aspects of Radiation Exposure Effects on the Population; 2) Research on Medical Consequences of Personnel Exposure to Radiation; and 3) Information Technologies in Research on Radiation Effects and Decision-Making Support. The JCCRER tasked its Executive Committee (EC) with identifying and approving pilot projects to be implemented under the program of cooperation during the year following the first JCCRER meeting.

The EC approved three projects under area 1.2 entitled "Risk Estimation for the Deterministic and Stochastic Exposure Effects and the Results of Actual Observations of the Population Health in the Region of the Industrial Association 'Mayak.'" These are: a) physical preservation of existing data; b) evaluation of cancer mortality in relation to radiation exposure among persons living in the vicinity of the Techa River; and c) development of a long-term Russian-American collaborative epidemiologic program for studying the stochastic effects of environmental radiation exposure in populations living near the Mayak Industrial Association. Several milestones were identified for each project to be completed during the pilot implementation phase following the first JCCRER meeting. These included conducting an inventory of existing records and data bases, determining record quality, developing a plan for data preservation, developing methods for determining vital status of exposed cohorts and for identifying unexposed comparison cohorts, reviewing the literature on past epidemiologic studies relevant to these populations, and developing a bibliographic data base. These milestones were successfully completed by the Project Research Team and results are summarized in the Final Report of the Project Implementation Phase (1).

This proposal is for a long-term Russian-American collaborative epidemiologic program to conduct follow-up and to evaluate mortality and morbidity among persons living in the vicinity of the Techa River and the East Ural Radioactive Trace. An ongoing three-year study of the Techa River cohort is being sponsored by the National Cancer Institute. The effort proposed here will complement the NCI study, which is limited to analyzing cancer mortality among the Techa River cohort as of 1992 and determining the most appropriate

comparison group for study. The present project will also lay the groundwork for continued follow-up and future collaborative studies of this unique cohort. This project will conduct epidemiologic follow-up to evaluate mortality and morbidity among members of a second cohort consisting of persons living in the vicinity of the East Ural Radioactive Trace.

II. Specific Objectives

The primary objective of this long-term collaborative epidemiologic project is to assess health risks due to long-term chronic exposure to ionizing radiation. Mortality and cancer morbidity will be evaluated in two populations exposed to environmental radiation contamination. Regional and national mortality rates will be used for external comparison purposes; internal comparisons will use the lowest exposure category as the referent. The feasibility of assembling appropriate non-exposed comparison cohorts will be assessed.

A. East Ural Radioactive Trace Cohort

Specific aims for the East Ural Radioactive Trace cohort are:

1. Evaluate risk of mortality from cancer and other causes of death among the East Ural Radioactive Trace Cohort.

2. Collaborate with scientists from project area 1.1 to develop estimates of individual doses for the EURT cohort.

3. Determine the feasibility of assembling an unexposed comparison cohort.

4. Develop a structure for future follow-up of the cohort.

B. Techa River Cohort

Specific aims for the Techa River cohort are:

1. Evaluate risk of mortality from non-cancer causes of death among the Techa River Cohort.

2. Collaborate with scientists from project area 1.1 to develop estimates of individual doses for the Techa cohort.

3. Determine the feasibility of obtaining cancer morbidity data and validating cancer diagnoses for the Techa River Cohort.

4. Develop a structure for future follow-up of the cohort.

Several tasks are proposed as feasibility studies to develop procedures for follow-up, to determine completeness of information, and to validate diagnoses.

III. Background and Significance

A. Background

The Mayak Industrial Association, located in the South Ural Mountains began operation in 1948 and was the first Russian site for the production and separation of plutonium. During the early days of operation, technological failures resulted in the release of large amounts of waste into the Techa River. There were also gaseous releases of radionuclides. Mayak operations resulted in prolonged exposures to populations living in areas affected by normal plant operations and by releases from accidents. Beginning in the fall of 1949, liquid radioactive wastes from the Mayak nuclear facility were discharged into the Techa/Iset river system and resulted in radiation exposure to residents of the riverside villages. Due to the contamination, 124,000 persons who lived on the banks of the Techa and Iset Rivers were exposed to varying levels of radioactivity. These individuals were exposed to external gamma radiation and long-lived radionuclides. About 25% of the release activity consisted of ^{137}Cs and ^{90}Sr, and exposures between 1950 and 1952 were reported to be the highest due to massive discharges from Mayak during that period. The Urals Research Center for Radiation Medicine (URCRM) created a registry of persons born in 1949 or earlier who lived in the villages on the Techa River during the period of highest exposure.

A total of 26,425 persons were identified as being eligible for inclusion in the Techa River cohort. The average effective dose equivalents were estimated to be from 0.074 Sv to 1.4 Sv, and the average bone marrow doses were estimated to be from 7.5 to 164 cGy. Between 1953 and 1961, a total of 7,500 residents of these villages were resettled in villages further away from the Techa. Another 12,000 persons were identified as residents who didn't live in Techa villages between 1950 and 1952 but moved into one of the exposed but not resettled villages after 1952. Approximately 20,000 progeny of exposed parents were identified. The progeny were identified on the basis of whether or not the father, mother or both parents were exposed. More than 3,000 individuals were identified as being exposed in-utero. Information contained in the registry includes: unique identification number; family name; date of birth; gender; place of residence at exposure; current address; and date of last address.

In September 1957, a thermal explosion in a liquid radioactive waste storage tank located at the Mayak production facility resulted in widespread radioactive

contamination north and east of the plant. The radioactive trace which was formed after the explosion, affected a number of rural settlements in Chelyabinsk, Sverdlovsk, and Tyumen Oblasts. Twenty-two villages located along the axis of the trace were evacuated within 10-250 days after the explosion. About 10,000 persons were evacuated from this part of the trace. Residents of the village of Metlino, located on the Techa River (and whose residents were also included in the Techa River cohort) were relocated once again. Follow-up of residents in the EURT cohort began in 1958. At this time, the Techa River cohort investigation was suspended. Physical examinations of the evacuated residents of the trace was initiated. In the EURT area within Chelyabinsk Oblast 20,000 people (of this number 8,000 were evacuated) received exposures ranging from 10 to 900 mSv. The radiation doses to bone marrow were estimated to be from 30 to 4,000 mSv. Approximately 6,000 residents of the Trace areas were examined between 1959-1961. Hard copies of the examination records are currently stored at URCRM. Eligibility for inclusion in the exposed cohort was based on the Mayak compensation lists. Residents had to be living in the evacuated territories on September 29, 1957 or had to be a resident of adjacent exposed but non-evacuated villages on the same date to be eligible for inclusion in the study cohort. The relocation lists were used as the basis for developing the EURT Registry. Tax books were also used and cross-checked with the compensation lists to determine study eligibility. Approximately 8,000 evacuated residents and 12,000 residents of the non-evacuated area currently comprise the EURT cohort. An additional 9,000 progeny of the exposed EURT cohort members have been identified but not followed.

B. Significance

Other populations exposed to chronic ionizing radiation include those exposed to environmental exposures from nuclear power generation, fallout from nuclear weapons testing, and environmental exposures from nuclear weapons production processes.

Several studies have been conducted of cancer mortality and morbidity in populations residing in the vicinities of nuclear power plants (2-7). These studies were based primarily on population rates of all cancers and for selected sites such as leukemia. Distance from the reactor or county of residence was used as a surrogate for radiation dose in all studies but one (6). In the study conducted by Hatch et al., of radiation exposures from the Three Mile Island accident, atmospheric dispersion models were developed and validated against measurements from off-site dosimeters (6). Taken as a group, the results of these studies provide no evidence of increased cancer rates associated with low-level exposures to ionizing radiation from nuclear power generation. Methodologic problems with these studies include the lack of individual dosimetry, limited statistical power, and little or no information on other factors which may influence

cancer rates. Jablon et al. evaluated county-based cancer mortality rates for the years 1950 through 1984 in populations residing around 52 civilian nuclear power plants and 10 Department of Energy nuclear reactors (7). Counties in which the reactors were located and adjacent counties were considered to be exposed while counties located further away were considered as comparison counties. Cancer mortality rates for 15 selected sites were compared between exposed and comparison county for each reactor and for pre- and post-operational time periods. The results from this study indicated no association between residence in a county with a nuclear reactor and increased cancer mortality rates. The study was limited by the lack of individual radiation doses. A study was conducted in France which investigated leukemia mortality in persons under the age of 25 who resided around 13 French nuclear reactor sites (8). The number of leukemia deaths did not differ from that expected based on population rates. Leukemia rates did not differ by gender, age, and distance from the reactor.

Two studies on the impact on childhood leukemia rates in the wake of the 1986 Chernobyl explosion have been reported. one in Sweden and one in Finland (9,10). Both studies analyzed leukemia rates among children under the age of 15 years in the most heavily contaminated areas of Sweden and Finland and compared these rates with those in other parts of the countries where the contamination was substantially lower. No significant differences in leukemia mortality rates were found to be associated with radioactive contamination from Chernobyl in either country.

Several studies have been conducted of health effects in populations exposed to radioactive fallout due to atmospheric and underground testing of nuclear weapons (11-15). A case-control study of leukemia was conducted in Utah (11). Estimated absorbed doses were calculated for all case and control subjects (12). The median bone marrow doses for all case and control subjects was 3.2 mGy with the estimated maximum mean dose being 29 mGy. In the case-control study, 1117 persons who died of leukemia and 5330 deceased controls were selected for study. A weak association between bone marrow dose and all cell types of leukemia was observed. Significant dose-response trends for excess leukemia risk were only found for certain leukemia cell type, ages, and times after exposure. The greatest excess risk was observed in persons in the highest dose group who had acute leukemia, were younger than 20 years of age at first exposure, and who died before 1964. A retrospective cohort study of thyroid disease associated with exposures to fallout radioiodines was conducted in Utah, Nevada and Arizona (13,14). Individual thyroid gland doses were calculated based on pathway analysis of fallout radioiodines and consumption patterns of milk (14). The mean absorbed dose to the thyroid ranged from 13 mGy to 170 mGy. Ten children had thyroid doses exceeding one Gy. A total of 2,473 persons were clinically evaluated for thyroid disease. A statistically significant excess of thyroid neoplasia was observed with the excess

relative risk estimated at 0.7% per mGy. A positive but nonsignificant dose-response trend was observed for thyroid nodules and carcinomas although the numbers of thyroid cancers were very small (N = 8) (13).

A study of childhood cancer incidence was conducted in Kazakhstan (15). Associations between cancer incidence rates and distance from the three former Soviet nuclear weapons test sites in Semipalatinsk and Pavlodar were analyzed. Distance from the three test sites (one site was an "atomic lake" created by four nuclear explosions in 1965) was used as a surrogate for radiation exposure. Cancer rates in children under the age of 14 between 1981 and 1990 were evaluated in the four zones around the test sites. The risk of acute leukemia rose significantly with increasing proximity to the test sites. The relative risk of leukemia for those living within 200 km of the test sites compared with persons living > 400 km was 1.76. Individual radiation doses were not calculated and the rates of cancer may have also been influenced by ethnicity and environmental chemical pollution.

A number of studies have been conducted of the possible association between radiation exposures as a consequence of nuclear weapons production and increased cancer morbidity and mortality, principally childhood leukemia. The majority of these studies have been conducted in the United States or the United Kingdom, and most are of the ecologic correlational design where changes in cancer rates were analyzed as a function of distance from the various weapons processing plants. None of the studies calculated individual radiation doses. The results of these studies have been thoroughly summarized in a review by Shlein et al. (16). The results of the studies in the main have supported no apparent increased risk of cancer morbidity and mortality associated with the levels of environmental ionizing radiation exposures expected of these types of operations. Many of the studies, however, were limited by inadequate statistical power, so that small increases in risk were unlikely to be detected. Also, uncertainties and misclassification in radiation exposures limit the interpretation of these data.

Radiation exposures estimated for subjects in the reviewed studies were, in general, much lower than those for individuals in the URCRM registry. The exposure situations that existed along the Techa and Iset rivers and in the East Ural Radioactive Trace provide a unique opportunity to evaluate the long-term health effects of chronic exposure to environmental radiation in two large populations. In addition, this study will be enhanced by a parallel dose-reconstruction study which will estimate individual doses for each study subject.

IV. Preliminary Studies

A computer-based individualized registry of exposed people was established at the Urals Research Center for Radiation Medicine (URCRM) to conduct long-

term follow-up studies of the health of the exposed populations. Data on mortality, cancer morbidity and other health outcomes have been collected by URCRM for more than four decades. Medical records have been preserved both on paper and in computer files. Death certificates of people exposed over 34-42 years since the beginning of the exposure are collected in the Death Registry, and cancer cases registered during the same period are stored in the file "Cancer Registry". These information sources constitute the basis for determining the long-term health effects of environmental radiation exposure.

Results from analyses of the registry data were published in a series of articles (17-26). Exposure dose assessment was based on: a) accumulation of external doses using values of on-site gamma-exposure levels and the residents' life styles; b) individual in vivo measurements of Sr-90 body contents in whole body counter SICH-9.1 for 14 thousand residents exposed in the Techa riverside villages. The leukemia death rate was elevated for the cohort exposed on the Techa. Using a relative risk model, the risk of leukemia was estimated to be 0.85 per 10,000 person-years/Gy, which is compatible with the respective values for A-bomb Life Span Study (LSS) cohort. The absolute risk value was estimated to be 0.45-1.1 cases per 10,000 person-years/Gy, which was about 3-5 times lower than the corresponding estimate obtained from the follow-up of atomic bomb survivors. A higher cancer mortality from certain types of solid cancer (cancer of the esophagus, cancer of cervix uteri) was noted for the cohort exposed on the Techa, and there was a slightly increased death rate from congenital anomalies among those exposed in utero. Preliminary analyses have indicated no increase in the rate of cancer among those exposed in the EURT area as of the present time; however, follow-up is incomplete for about one-third of the cohort, and vital status for the remainder of the cohort is complete only through 1983.

URCRM has assembled a well-organized data base for the purposes of conducting epidemiologic studies of radiation-related health risks under the unique conditions of chronic exposure in the South Urals at a wide range of doses; however, the earlier analyses had several limitations which will be addressed by the present study. These include: a) follow-up for these studies was only completed through 1983; b) lack of a fixed comparison group; c) loss of a significant number of exposed people to follow-up; and d) dosimetry estimates need substantial refinement.

V. Research Design and Methods

A. Study Population

1. East Ural Radioactive Trace Cohort (EURT)

The definition of the East Ural Radioactive Trace Cohort is the following: anyone who resided in the area of Chelyabinsk Oblast covered by the Trace at the time of the accident. For the EURT cohort, URCRM scientists used the information contained in tax books and resettlement and compensation lists (Mayak books) to determine the basis for completeness and inclusion in the registry. A total of about 20,000 individuals are included in the cohort. Residents had to be living in the evacuated territories on September 29, 1957 or had to be a resident of adjacent exposed but non-evacuated villages on the same date to be eligible for inclusion in the study cohort. Identification and follow-up through 1983 is complete for 8,083 residents who were evacuated from the trace. About 12,380 residents lived in the adjacent non-evacuated areas. Follow-up is complete through 1983 for 8,380 of these individuals, and approximately 4,000 are lost to follow-up.

2. Techa River Cohort

The definition of the Techa River Cohort is the following: any person residing in a village adjacent to the Techa River downstream from the Mayak production plant to where the Techa enters the Iset River, a distance of 237 kilometers. This area includes persons residing in both the Chelyabinsk and Kurgan Oblasts in the following five rayons: Krastnoarmeysky, Kunashksky and Kaslinsky in Chelyabinsk Oblast, and Katayaky and Dalmatovsky in Kurgan Oblast. To be eligible for inclusion, a person had to reside in one of these villages for at least one month between 01 January 1950 through 31 December 1952. Although persons living in these villages were likely exposed to radiation from Mayak prior to 1950, the greatest radiation exposures occurred from 1950 through 1952. The registry assembled and maintained by the URCRM for the past 40 years will be used as the basis for identifying study subjects for this project.

An estimated 1,700 persons are included in both the Techa and EURT cohorts. This group consists primarily of residents of the village of Metlino, who were resettled twice, once after 1952 and again after the 1957 accident at Mayak.

3. Sources of URCRM Registry Data

The following sources of information were used to construct the URCRM registry which contains information on subjects in both cohorts:

a. Relocation lists

Entire villages were resettled due to the contamination along the Techa River. In the 1950's, the Regional authorities prepared lists of families and family members who were evacuated. Information contained in the resettlement books included family name, address, year of birth, profession, amount of compensation, and village of resettlement (or if they refused to be resettled). The relocation books were not available for all villages. The existing books were checked against other resources to determine their completeness and how comparable the information was contained in the different sources.

b. Internal passports

Each citizen of the former Soviet Union was required to maintain an internal passport which included information on name, date and place of birth, place of residence, and passport number. This system of registration was relatively complete except for certain rural areas where residents didn't have internal passports until the end of the 1960's. The internal passport was used to track the comings and goings of residents. Whenever a resident traveled to another village or city, they had to register their passport at the local militia office. The passports were used to confirm place of residence for cohort identification.

c. Tax books

Every family residing in an administrative area was included in the local tax book. Information contained in these books included for each family: family name, names of all of the members of the family, relationships, birth dates, ethnic group, school, size of house and list of possessions. The tax books were maintained and administered by the Rayon authorities. They were completed by members of the local village Soviet council. Every three years, a new tax form was completed and information in the books was updated. Tax books were complete for the years 1950 through 1983. However, there were missing tax books for some villages in the Techa River cohort.

d. Detailed military maps

Detailed maps prepared by the military were used to identify cottages and private homes in the study areas. Study investigators used these maps to go to the resettlement areas to interview residents, show them the maps, and ask them to identify their house and those of their neighbors. Many residents were located in this fashion. The information from this source was compared to that in the medical records.

A linked record was prepared containing information from the following sources:

a) tax books
b) military maps
c) interviews
d) medical records
e) Mayak resettlement books

Completeness of the Techa River exposed cohort was determined by comparing the pre-1950 tax books for villages along the Techa with tax books for the 1950-52 period. During the first stage of the study, the cohort excluded teachers and physicians who worked in the villages but did not reside there. The study investigators went to the regional administration office to determine who was sent to work in the villages. Children who resided in two orphanages in 1950-52 were identified through records maintained at the regional administration office. In 1993, the regional government decreed that a list should be prepared for all resettled persons so that they could receive certificates of relocation. The URCRM registry lists were compared with the government lists to determine completeness. This work continues, and to date, six of the 13 lists have been completed. The government relocation lists contain family name, date of birth, internal passport number, and reason for compensation regardless of where they live. The lists were completed only for those persons still alive as of the end of 1993. Based on assessment of multiple sources of information, especially comparing the pre-1950 tax books with the residents enrolled in the cohort, the URCRM investigators believe that the Techa registry is almost 100% complete.

e. Books for registered evacuees

In 1992, the Russian Federation passed a law entitling citizens accidentally exposed to radiation to governmental aid. The passage of this law ("On Social Support to Citizens Exposed to Radiation") was followed by the President's decree on its application to individuals exposed from the activities of the MAYAK Industrial Association. Commissions were established to create registries of evacuated persons eligible to receive the certificates. The registries of eligible citizens included surname, given name, patronymic, current address, passport number, a list of documents substantiating the applicant's right to a certificate, identification number, and certificate number. Xerox copies of these books will allow the URCRM staff to identify the place of residence of exposed and evacuated people at the time of issuance of certificates (about 1993,1994). In all, 7500 thousand residents were evacuated from the Techa riverside villages between 1953 and 1961. Evacuees were people who lived on the banks of the Techa River from 1950-1952, as well as those who moved to the area later and lived there until

evacuation. Work to match the information in these books has begun, and indicates that the books will be a good source for tracing persons currently lost to follow-up.

URCRM maintains hard copy records and a large computer database containing information collected during the formation of the registry. The hard copy records and computer databases are described in Appendices A and B.

B. Data Collection

1. East Ural Radioactive Trace Cohort

a. Trace lost to follow-up

In past follow-up efforts, URCRM researchers have used death certificates, local address bureaus, and personal contacts with cohort members and their relatives to determine vital status.

Because there is no Russian registry of deaths that covers the whole country, several sources of death information are used by URCRM to ascertain deaths in their study populations. The primary source is the office of the regional registrar (at the rayon level), known as "ZAGS," where the death certificates may be retrieved. The second source is the next-of-kin, relatives and friends. Any person who comes to the clinic for an examination is questioned regarding the status of all next-of-kin. Detailed information is collected for each of the relatives for the following items: vital status, residence, health, and place of death if dead. If a study subject is reported to be dead, URCRM will write to ZAGS in the rayon where the person died to obtain a copy of the death certificate.

URCRM has collected approximately 70% of the death certificates for persons who are known to be deceased. The 30% that they are lacking are from people who moved away. For the majority of those who are dead and moved away, URCRM knows where and when they died. When a person leaves the 5 rayons around Chelyabinsk or moves to a new oblast or one of the other independent states, it becomes much more difficult to obtain a death certificate. The majority of the 30% of unretrieved certificates are from deaths in the Chelyabinsk Oblast, but outside the 5 rayons in the Oblast that are routinely searched. The missing death certificates are spread across the entire 33 year period of follow-up, but most are in the later years due to the aging of the population. All death certificates in the five rayons where the EURT and Techa cohorts are located have been collected from 1945 through 1992.

Each person in a region is required to register their passport at the local militia office. The local address bureau officials apply to the militia department to

verify whether a person lives in a particular region or Oblast. The researchers at URCRM have to pay for the new address information. The address bureau will give the current address for people still living in the Oblast and will let the researchers know if a person has moved away; however, forwarding addresses are not available. This office may or may not indicate if a person has died. Tax rolls are also used to ascertain deaths. All the tax rolls were examined for migration and death through 1983. Prior to terminating the use of the tax rolls, URCRM had been making mortality updates once every five years and this was their main source of follow-up.

URCRM researchers have not traced EURT subjects who migrated to distant regions because of the cost in doing so. Vital status determination is complete through 1983 for most of the EURT cohort, but is unknown for about 4,000 people who migrated from the contaminated area. A number of methods and techniques for determining vital status will be analyzed and tested during the first year of the study. Proposed methods for tracing subjects lost to follow-up are: (1) using information from the books listing registered evacuees from the contaminated territories; (2) abstracting information from address registration documents; (3) interviewing relatives; (4) making inquiries at address bureaus; (5) writing to subjects at their last known address. Methods to be used for retrieving death certificates are: (1) computer matching death certificates to the study cohort file; (2) interviewing the next of kin; and (3) making inquiries at the Civil Registrar's Office. A structure will be developed to update vital status at regular intervals (e.g., every two to three years). This will include efforts to locate as many subjects lost to follow-up as possible.

b. Code and computerize death certificate information

About 7,000 death certificates through 1993 have been collected for residents of the five rayons where the EURT and Techa cohorts are located, but have not been matched with the URCRM registry or computerized. These death certificates will be matched with the registry to identify those deaths occurring among members of the EURT cohort. Underlying cause of death will be coded and data from the appropriate death certificates will be key entered and added to the registry.

c. Verify completeness of cohort subjects born after 1957 but still living in contaminated zone

Birth certificates for persons born after 1957 in Chelyabinsk Oblast who are living in the contaminated area will be copied and computerized to verify completeness of that subset of the EURT cohort.

d. Determine feasibility of obtaining cancer morbidity information

A cancer morbidity file has been developed at the URCRM. A 1964 decree issued by the Soviet Ministry of Public Health stated that for all cases of cancer diagnosed by a physician, a special notification form had to be completed. The completed forms were sent to a specialized oncology center located in each Oblast. This center coordinated cancer notification and reporting for every Rayon in the Oblast, and the forms are maintained by the center for a minimum of three years. Each year, scientists from the URCRM visited the oncology centers in Chelyabinsk and Kurgan (until 1970) Oblasts to make copies of the notification forms. This data source may be useful to calculate population rates for cancer for each rayon in the two Oblasts and thus serve as a potential source of an external comparison group. The notification system is approximately 90 - 95% complete. Records for all cancer cases in three rayons of Chelyabinsk Oblast in the Trace area, including the resettled area, are collected on a routine basis and are complete through 1992. Data for residents of Kurgan Oblast are complete only from 1950 through 1970. The names are matched with the list of exposed subjects to determine cancer incidence for the cohort. Cases not exposed may be used as numerators to calculate rates for the unexposed areas.

A one-year feasibility study will be conducted to determine whether cancer morbidity can be determined for the EURT cohort. Information is currently available on cancer morbidity for about 40% of the cohort from two of the rayons, and may be less complete for the third. During the one-year feasibility study, the oncology centers in each rayon will be visited to determine completeness of information on cancers diagnosed among the EURT cohort. All cases of cancer occurring among residents of these rayons will be determined. The names will be matched with the list of exposed EURT subjects. At the time of these visits, the availability of pathological materials (slides, blocks) for validating diagnoses will be determined. Cancer cases ascertained from the oncology centers will also be matched against the roster of deceased subjects to determine whether individuals reported to have died from cancer were recorded by the oncology centers as having cancer. If sufficient information is available to determine cancer morbidity for this cohort, and pathological materials are available to validate diagnoses, detailed procedures for collecting appropriate information and validating diagnoses will be developed. This effort will be conducted concurrently with the effort to validate cancer diagnoses for the Techa River Cohort.

e. Dosimetry

Current dose estimates are based on individual measurements of internal dose for about 50% of the cohort using a whole body counter and on measures of

external dose using gamma dose rate as measured in the air and life style patterns. Dose estimates will be verified and improved using methods developed by the dosimetry team in a parallel project (27). A one-year feasibility study will be conducted prior to a full-scale dose reconstruction effort. The dosimetry team will calculate collective doses for each village, and the epidemiology team will calculate statistical power for detecting excess risk for specific cancer sites. An assessment will be made by the epidemiology-dosimetry project teams at the end of this year to determine the best approach for calculating doses for this cohort. If there is sufficient statistical power, doses to bone, lung, gastrointestinal tract, liver, breast, uterus, brain will be estimated. The contribution of external dose to total dose will be determined. Individual doses are desirable, but for many subjects, group doses will have to be calculated. This task will be completed by the dosimetry team under Project 1.1.

f. Identify unexposed comparison population

A one-year feasibility study will be conducted to determine the best unexposed comparison population. It may be possible to use tax books for a few villages to identify and follow an unexposed cohort. A determination of which villages were actually exposed to routine Mayak plant operations must be made so that they may be excluded from the unexposed comparison population rates. This issue will be addressed by the Project 1.1 dosimetry team.

g. Computerize outpatient card data

Outpatient cards maintained by URCRM have not been computerized and will be key entered. These records contain information that will assist in validating cancer diagnoses and in reconstructing doses for this cohort. The same file structure as that for the Techa River cohort will be used in adding this information to the URCRM registry. All of the existing EURT registry data has been merged with the Techa River cohort, but is in a slightly different format. Data for the EURT cohort will be re-structured to match that of the Techa River cohort.

2. Techa River Cohort

Under an ongoing project (1.2b, being conducted by the National Cancer Institute) mortality follow-up for this cohort will be completed through 1992. The three-year NCI study is limited to an evaluation of cancer mortality through 1992 and identification of a suitable comparison cohort. The present study will establish a long-term collaborative epidemiologic program to continue follow-up beyond 1992, and to evaluate cancer morbidity and mortality from non-cancer health outcomes. Some of the activities proposed will be conducted concurrently with project 1.2b,

while others will begin after results are available from the NCI study and from feasibility studies to be conducted under this project.

a. Concurrent Activities.

i. Determine completeness of cancer morbidity information

During the first year of this project, the completeness of current information will be assessed. Cancer cases ascertained to date from the oncology centers will be matched against the roster of deceased subjects to determine whether individuals known to have died from cancer were recorded by the oncology centers as having cancer. All cancer deaths should appear in the morbidity file. In addition, the morbidity file should contain more cases of each type of cancer than the mortality file, particularly, for non-fatal types of cancer and those associated with long survival. If information provided by the oncology centers appears to be complete, cancer morbidity information for Chelyabinsk Oblast will be updated during the subsequent two years with the most recent information available. URCRM staff will copy the cancer notifications from the oncology center in Chelyabinsk Oblast and enter the information into the computer data base.

A one-year feasibility study will be conducted to determine the availability and completeness of cancer incidence data for residents of the two rayons in Kurgan Oblast after 1970. A recent review of oncology records in Kurgan Oblast indicates that information is complete for the time periods 1950 through 1970 and from 1981 to 1995. URCRM staff will visit the oncology center in Kurgan Oblast and determine whether complete information on cancers diagnosed between 1970 and 1981 can be retrieved. All cases of cancer occurring among residents of the two rayons in Kurgan Oblast will be determined. The names will be matched with the list of exposed subjects. Those not exposed may be used to calculate morbidity rates for the unexposed.

ii. Validate cancer diagnoses

Procedures for validating cancer diagnoses will be developed in parallel with those for the EURT cohort (V.B.1.d). The URCRM has maintained a repository of over 2,000 stored bone and bone marrow tissue samples representing over 1,200 individuals where a hematological illness, not necessarily leukemia, was suspected. These can be used to validate hematopoietic malignancies. A one-year feasibility study will be conducted to determine the availability of pathological materials for validating other cancer diagnoses and to develop procedures for such validation. The feasibility of using tissue slides for validating hematologic and solid tumor diagnoses in Chelyabinsk and Kurgan Oblasts will also be explored. During the

visits to the oncology centers for V.B.1.d above, URCRM will determine the availability of tissue slides and blocks for cancer cases in the Techa River cohort diagnosed after 1950.

iii. Computerize data necessary to complete dosimetry

Information on distance of home to the Techa River, consumption of fish from the river, and consumption of river or well water is contained in the outpatient records for approximately 45% of the outpatient records for the Techa River cohort. This information needs to be abstracted from the outpatient records and entered into the computer. Abstract forms will be developed by URCRM staff. The outpatient record for each subject will be obtained from URCRM hard copy files, and information will be entered onto the abstract form. The data will be key entered and placed in the URCRM computer data base.

iv. Dosimetry

Current dose estimates are based on individual measurements of internal dose for about 50% of the cohort using a whole body counter and on measures of external dose using gamma dose rate as measured in the air and life style patterns. Dose estimates will be verified and improved using methods developed by the dosimetry team in a parallel project (27). Doses to bone, lung, gastrointestinal tract, liver, breast, uterus, brain will be estimated for each member of the cohort. The contribution of external dose to total dose needs to be determined. This task will be completed by the dosimetry team under Project 1.1 and methods are described in detail in a separate protocol (27).

b. Future Activities

i. Develop structure for continued follow-up for mortality and cancer morbidity

Past follow-up efforts are described in section V.B.1.a above. URCRM researchers have not traced people who migrated to distant regions because of the cost in doing so. Approximately 3,500 persons from the Techa River cohort are known to have left the area for distant regions. Some people who have moved to other regions still come back to the clinic periodically so the staff at URCRM knows that they're still alive and they are questioned regarding others in their families who may have moved, also.

During the present project, a structure will be developed for updating vital status information and obtaining cancer morbidity information on the cohort at regular intervals every two to three years beyond 1992. Mechanisms identified for

conducting follow-up were identified during the pilot feasibility study include: (1) using information from the books listing registered evacuees from the contaminated territories; (2) abstracting information from address registration documents; (3) Interviewing relatives; (4) Making inquiries at address bureaus; (5) writing to subjects at their last known address. Methods to be used for retrieving death certificates are: (1) computer matching death certificates to the study cohort file; (2) interviewing the next of kin; and (3) making inquiries at the Civil Registrar's Office. Through experience gained from vital status follow-up being conducted through 1992 for the NCI study, the investigators will develop a manual of procedures for continuing follow-up of the cohort. This will include specific procedures for tracing subjects who have migrated or whose vital status is unknown.

C. Data Analyses and Statistical Power

We hope to be able to examine morbidity rates for specific cancer sites by dose, ethnicity, gender, and age for the EURT and Techa River cohorts, mortality from specific cancer sites among the EURT cohort, and mortality from non-cancer causes among both cohorts. In particular, we are interested in morbidity and mortality from all cancers and from leukemia. For each cohort will compare cause-specific numbers of deaths (or incident cases of cancer) observed among the study cohort with the numbers that would be expected based on rates in a suitable comparison cohort, adjusting for calendar period, attained age, and ethnicity. A time-failure multivariate model (28) will be used to evaluate the relationship between radiation dose and cancer mortality (all sites combined and separately for leukemia and other sites of interest), adjusting for the potential confounding effects of attained age, ethnicity, and other factors. Our ability to conduct these analyses is dependent on the success of several feasibility studies that will be conducted during the first year of this three-year project. These efforts include: determining whether cancer morbidity can be validated for both cohorts, evaluating whether efforts are successful in determining vital status for those lost to follow-up, and determining the appropriate comparison populations. Our ability to evaluate morbidity and mortality for specific doses is dependent on the success of the dose reconstruction project. Calculations of statistical power for detecting excess risk of specific cancer sites of interest will be conducted as soon as there is sufficient information on dose and the size of various subgroups of both cohorts. A detailed plan for data analyses will be developed for each cohort and submitted to the Scientific Review Group for review before the third year of the project.

VI. Quality Control/Quality Assurance

Several activities to be conducted under this protocol have been proposed as feasibility studies to ensure completeness and accuracy of existing data and to complete tracing of lost to follow-up. Procedures developed for future follow-up and

validation of diagnoses will take into account the success rates from the various methods employed during the feasibility studies. New data collected during the course of this investigation will be double key entered to ensure accurate data entry. Routine quality control procedures for developing and maintaining the URCRM computer database are described in Appendix B. The current system of checking variable ranges and internal consistency of death certificate data will be reviewed and enhanced as necessary for this study. Steps will also be taken to assess the quality of coding. In particular, information for a 5% sample of subject records will be validated and a 10% sample of death certificates will be recoded and the results compared to data already in the system. Causes of death for deaths from 1950 to 1982 have been coded using ICD-8 codes. These will be recoded to ICD-9 using computer conversion programs. Efforts will be made to validate cancer diagnoses for both the EURT and Techa River cohorts (see V.B.1.d and V.B.2.a.i and V.B.2.a.ii) using medical records, slides, blocks and other available information.

VII. Collaborators/collaborating Institutions

A. Overall Project Management

1. Russian Team - URCRM

Dr. Mira Kossenko, Principal Investigator

a. Role: scientific supervision of the research, setting-up of epidemiological tasks, identification of volume and quality of information on cancer mortality for people exposed on the Techa, data analysis, preparation of reports and publications

b. Percent effort on this project: 25-30%

c. Other sources of support:
RFP Number NCI-CP-50507-13 Epidemiologic Studies of the Mayak and Techa River Cohorts in the Russian Federation": 20-25% of time.

Catherine M. Zhidkova, Project Coordinator

a. Role: delivery of the products required by the Project (progress and final reports) and all required documentation to the EC of the JCCRER by the dates indicated in the Project; prepare official correspondence related to the Project issues related to data sharing involving URCRM DB, information dissemination, intellectual property, copyright translation into English/Russian of scientific reports to be submitted to the EC of the JCCRER

Planning and organization of Project-related visits to the URCRM of foreign participants, interpreting

b. Percent effort on this project: 30%

c. Other sources of support:
NCI-CP-50517-13 "Epidemiologic Studies of the Techa River and Mayak Cohorts in the Russian Federation": 20% of time.

Lydia Nikolayenko, Data Base Manager

a. Role: improvement and updating of the computerized data base comprising information on residents exposed on the river Techa and the EURT territory (registry, migration, death certificates, cancer morbidity), selection of sets of information to be analyzed, checking information quality.

b. Percent effort on this project: 30%

c. Other sources of support:
RFP Number NCI-CP-50517-13 "Epidemiologic Studies of the Mayak and Techa River Cohorts in the Russian Federation": 20% of time.

2. American Team

Dr. Terry Thomas, Principal Investigator
Uniformed Services University of the Health Sciences

a. Role: Technical assistance, support, and collaboration on study design and development, data collection; data analyses; preparation of reports and publications

b. Percent effort on this project: 10%

c. Percent of time committed to other projects: 30%

Dr. Daniel Hoffman, Co-Principal Investigator
The George Washington University

a. Role: Technical assistance, support, and collaboration on study design and development, data collection; data analyses; preparation of reports and publications

b. Percent effort on this project: 10%

c. Percent of time committed to other projects: 20%

B. East Ural Radioactive Trace Cohort

1. Russian Team - URCRM

The Russian team will be responsible for the day to day management of project activities, including data collection, data entry, and editing. The Russian team will also collaborate with the American team on study design, data collection, and analyses. Members of the Russian team will visit the U.S. each year for small focused workshops and training.

D. Lioudmila Krestinina, Project Director

a. Role: carrying out studies aimed at radiation effects assessment for people exposed in the EURT area, summarizing the information on death cases for this cohort, assessment of completeness of the registry, preparation of scientific publications

b. Percent effort on this project: 30%

c. Other sources of support:
RFP Number NCI-CP-50517-13 "Epidemiologic Studies of the Mayak and Techa River Cohorts in the Russian Federation", 20% of time.

Svetlana Nizhegorodova (Epifanova), Computer Programmer

a. Role: development of software for DB management and supporting problem files

b. Percent effort on this project: 30%

c. Other sources of support:
RFP Number NCI-CP-50517-13 "Epidemiologic Studies of the Mayak and Techa River Cohorts in the Russian Federation": 20% of time.

3 technical support personnel

2. American Team

The American team will provide technical assistance, support and collaboration on study design, data collection, and analyses. Members of the U.S. team will visit Chelyabinsk a minimum of two times per year to provide technical assistance for ongoing projects and to collaborate in data collection and analyses.

Dr. Daniel Hoffman, Project Director
The George Washington University

Dr. Terry Thomas, Co-Project Director
Uniformed Services University of the Health Sciences

Dr. Donna Cragle, Epidemiologist
Oak Ridge Institute for Science and Education

C. Techa Cohort Project Management

1. Russian Team - URCRM

The Russian team will be responsible for the day to day management of project activities, including data collection, data entry, and editing. The Russian team will also collaborate with the American team on study design, data collection, and analyses. Members of the Russian team will visit the U.S. each year for small focused workshops and training. Specific roles are the following:

Dr. Mira Kossenko, Project Director

Dr. Yevgeniya Ostroumova, Epidemiologist

a. Role: studies on late effects of radiation for exposed Techa residents, data collection, analysis, calculation of cancer morbidity, risk assessment
b. Percent effort on this project: 50%
c. Other sources of support:
does not participate in other international projects; time spent on Russia-funded projects: 50%

Dr. Nadezhda Gudkova, Epidemiologist

a. Role: studies of general and cancer mortality for people exposed on the Techa, data collection, analysis
b. Percent effort on this project: 50%

c. Other sources of support:
does not participate in other international projects; time spent on Russia-funded projects: 50%

Svetlana Nizhegorodova (Epifanova), Computer Programmer

a. Role: development of software for data base management and supporting problem files
b. Percent effort on this project: 30%
c. Other sources of support:
RFP Number NCI-CP-50517-13 "Epidemiologic Studies of the Mayak and Techa River Cohorts in the Russian Federation": 20% of time.

4 technical support personnel

Oncological Center, Kurgan Oblast
1 person

Oncological Center, Chelyabinsk Oblast
1 person

2. American Team

The American team will provide technical assistance, support and collaboration on study design, data collection, and analyses. Members of the U.S. team will visit Chelyabinsk a minimum of two times per year to provide technical assistance for ongoing projects and to collaborate in data collection and analyses.

Dr. Terry Thomas, Project Director
Uniformed Services University of the Health Sciences

Dr. Daniel Hoffman, Co-Project Director
The George Washington University

Dr. Donna Cragle, Epidemiologist
Oak Ridge Institute for Science and Education

VIII. Human Subjects Considerations

A registry containing medical and follow-up information on members of the EURT and Techa River cohorts is maintained by the URCRM and was compiled from several sources as described above. In addition, subjects with hematological disorders have been examined and treated at the URCRM. All hard copy records are maintained by the URCRM in locked file areas. Access is provided only to research and medical staff as necessary. Computer data bases are password protected, and access to various modules is provided to researchers and medical staff of the URCRM only on an "as needed" basis. Identifying information is maintained only for the purposes of tracing cohort members and for maintaining patient treatment records. Each subject has been assigned a unique systemic number. To protect confidentiality many of the modules in the computer data base have been stripped of all identifying information except for the systemic number which is used to link data from the various modules. There will be no contact with study subjects during the course of this investigation except during tracing of lost-to-follow-up or during routine clinic visits. Tracing may involve contacting some of the subjects or their next-of-kin only for the purpose of determining current vital status. All files used for epidemiologic analyses will be stripped of identifying information except for the unique systemic number. Reports of results will contain totals, averages, and other statistics and will not contain any information which would allow the identification of any individual.

This project plan along with other appropriate documentation will be submitted to Institutional Review Boards at the Uniformed Services University of the Health Sciences and the George Washington University for approval of research involving human subjects. On the Russian side documentation will be submitted to the Institutional Review Board at the Urals Research Center for Radiation Medicine for approval.

IX. Timetable for Long-Term Collaborative Epidemiologic Program (first 3 years).

A. East Ural Radioactive Trace Cohort

	Year 1	Year 2	Year 3
Tracing of Lost to Follow-up	Feasibility - 1 Year	Follow-up - 2 Years	
Coding & Computerization of Death Certificates	1 Year		
Verify Completeness of Cohort Born > 1957		2 Years	
Determine Availability of Cancer Morbidity	Feasibility - 1 Year	Abstract & Computerize	
Dosimetry (Project 1.1)	Calculate Collective Doses	Individual doses to selected target organs	
Unexposed Comparison Population	Feasibility - 1 Year	Data Collection/Follow-up	
Data Analyses		Power / Plan Analyses	Data Analysi
Computerize Outpatient Records		2.5 Years	

B. Techa River Cohort

	Year 1	Year 2	Year 3
Determine Completeness of Cancer Morbidity	Feasibility - 1 Year	Abstract & computerize	
Cancer Morbidity for Kurgan Oblast	Feasibility - 1 Year	Abstract & computerize	
Validate cancer diagnoses		2 Years	
Computerization of data	2.5 Years		
Dosimetry (Project 1.1)	Individual doses to selected target organs		
Continue follow-up for mortality & morbidity			Continuous follow-up→
Data Analyses		Power / Plan Analyses	Data Analysis

X. Estimated Budget for URCRM

A. East Ural Radioactive Trace Cohort

DIRECT COSTS					
		Year 1	Year 2	Year 3	Total
A. Personnel	Hours/Year				
Principal Investigator	500	$2,000	$2,100	$2,205	$6,305
Project Coordinator	500	$1,500	$1,575	$1,654	
Senior Researcher	1000	$3,000	$3,150	$3,308	$9,458
Data Base Manager	500	$1,250	$1,313	$1,378	
Programmer	1000	$2,500	$2,625	$2,756	$7,881
Technician	1500	$2,400	$2,520	$2,646	$7,566
Technician	1500	$2,400	$2,520	$2,646	$7,566
Technician	1500	$2,400	$2,520	$2,646	$7,566
Coder/Nosologist	1500	$3,300	$3,465	$3,638	$10,403
Oncology Center Specialist	500	$1,100	$1,155	$1,213	$3,468
Total		$21,850	$22,943	$24,090	$68,882
Payroll Taxes (79%)		$17,262	$18,125	$19,031	$54,417
Total Personnel		$39,112	$41,067	$43,120	$123,299
B. Equipment					
Laptop Computer		$2,300			$2,300
Laser Printer		$1,250			$1,250
Scanner		$650			$650
Portable Copier		$1,650			$1,650
Total Equipment		$5,850			$5,850
C. Travel					
2 Trips/Year to U.S.		$6,000	$6,200	$6,400	$18,600
D. Other					
Office Supplies		$600	$600	$600	$1,800
Communications (Phone,Fax)		$500	$500	$500	$1,500
TOTAL DIRECT COSTS		$52,062	$48,367	$50,620	$151,049
INDIRECT COSTS (40% of Personnel)		$8,740	$9,177	$9,636	$27,553
TOTAL		**$60,802**	**$57,544**	**$60,256**	**$178,602**

B. Techa River Cohort

DIRECT COSTS					
A. Personnel	Hours/Year	Year 1	Year 2	Year 3	Total
Principal Investigator	500	$2,000	$2,100	$2,205	$6,305
Project Coordinator	500	$1,500	$1,575	$1,654	$4,729
Epidemiologist	1000	$3,000	$3,150	$3,308	$9,458
Epidemiologist	1500	$3.750	$3,938	$4,134	$11,822
Data Base Manager	500	$1,250	$1,313	$1,378	$3,941
Programmer	1000	$2,500	$2,625	$2,756	$7,881
Technician	1500	$2,400	$2,520	$2,646	$7,566
Technician	1000	$1,600	$1,680	$1,764	$5,044
Technician	1000	$2,200	$2,310	$2,426	$6,936
Oncology Center Specialist	1500	$1,800	$1,890	$1,985	$5,675
Total	1000	$2,200	$2,310	$2,426	$6,936
Payroll Taxes (79%)		$24,200	$25,410	$26,681	$76,291
Total Personnel		$19,118	$20,074	$21,078	$60,269
		$43,318	$45,484	$47,758	$136,560
B. Equipment					
Laptop Computer		$2,300			$2,300
Laser Printer		$1,250			$1,250
Scanner		$650			$650
Portable Copier		$1,650			$1,650
Total Equipment		$5,850			$5,850
C. Travel					
2 Trips/Year to U.S.		$6,000	$6,200	$6,400	$18,600
D. Other					
Office Supplies		$600	$600	$600	$1,800
Communications (Phone,Fax)		$500	$500	$500	$1,500
TOTAL DIRECT COSTS		$56,268	$52,784	$55,258	$164,310
INDIRECT COSTS (40% of Personnel))		$9,680	$10,164	$10,672	$30,516
TOTAL		**$65,948**	**$62,948**	**$65,930**	**$194,826**

C. Budget Justification

1. Personnel

The roles of each of the key personnel from URCRM are described in Section VII, Collaborators/Collaborating Institutions. The technicians are needed to abstract, code and key enter data collected during the study. The Nosologist will code underlying cause on death certificates for the East Ural Radioactive Trace study. The oncology center specialists will assist in the collection of cancer morbidity information and in locating pathological materials for validation of diagnoses.

2. Equipment

The laptop computers are necessary for recording information and preparing documents during visits to the oncology centers and other offsite locations to complete the tasks described. The scanners are necessary to preserve photocopies of death certificates, oncology records, and other records collected during the follow-up and diagnosis validation efforts. The portable copiers are necessary to photocopy death certificates and oncology records at offsite locations. The laser printers are necessary to print documents prepared during the course of the study.

XII. References

1. Kossenko MM, Thomas TL, Hoffman DA. Risk estimation for the deterministic and stochastic exposure effects and the results of actual observations of the population health in the region of the industrial association "MAYAK" : Report of the Pilot Project Implementation Phase. Submitted to the Department of Energy, Office of International Health Studies, March 1996.

2. Lambert JY, Cornell RG.: A study of vital rates near a nuclear reactor. Arch Environ Health 1980;35:235-239.

3. Enstrom JE.: Cancer mortality patterns around the San Onofre nuclear power plant, 1960-1978. Am J Publ Health 1983;73:83-92.

4. Clapp R, Cobb S, Chan C, et al.: Leukemia near Massachusetts nuclear power plant (letter). Lancet 1987;2:1324-1325.

5. Poole C, Rothman KJ, Dreyer NA.: Leukemia near Pilgrim nuclear power plant, Massachusetts (letter). Lancet 1988;2:1308.

6. Hatch MC, Beyea J, Nieeves JW, et al.: Cancer near the Three Mile Island nuclear plant. Am J Epidemiol 1990;132:397-417.

7. Jablon S, Hrubec Z, Boice JD, et al.: Cancer in populations living near nuclear facilities. A survey of mortality nationwide and incidence in two states. JAMA 1911;265:1403-1408.

8. Hattchouel J-M, Laplanche A, Hill C.: Leukemia mortality around French nuclear sites. Br J Cancer 1995;71:651-653.

9. Hjalmars U, Kulldorff M, Gustafsson G.: Risk of acute childhood leukemia in Sweden after the Chernobyl reactor accident. Br. Med J 1994;309:154-157.

10. Auvinen A, Hakama M, Arvela H, et al.: Fallout from Chernobyl and incidence of childhood leukemia in Finland, 1976-1992. Br Med J 1994;309:151-154.

11. Stevens W, Thomas DC, Lyon JL, et al.: Leukemia in Utah and radioactive fallout from the Nevada test site. A case-control study. JAMA 1990;264:585-591.

12. Simon SL, Till JE, Lloyd RD, et al.: The Utah leukemia case-control study: Dosimetry methodology and results. Health Phys 1995;68:460-471.

13. Kerber RA, Till JE, Simon SL, et al.: A cohort study of thyroid disease in relation to fallout from nuclear weapons testing. JAMA 1993;270:2076-2082.

14. Till JE, Simon SL, Kerber R, et al.: The Utah thyroid cohort study: analysis of the dosimetry results. Health Phys 1995;;68:472-483.

15. Zaridze DG, Li N, Men T, et al.: Childhood cancer incidence in relation to distance from the former nuclear testing site in Semipalatinsk, Kazakhstan. Int J Can 1994;59:471-475.

16. Shlein B, Ruttenber AJ, Sage M: Epidemiologic studies of cancer in populations near nuclear facilities. Health Phys 1991;61:699-713.

17. Buldakov L.A., Demin S.N., Kossenko M.M. et al. Health effects a of radiation accident in the South Urals in 1957. Meditsinskaya Radiologiya (1990), N 12, p. 11-15.

18. Akleyev A.V., Goloshchapov P.V., Degteva M.O., et al. Radioactive contamination of the environment in the South Urals region ant its impacts on the population's health. Under the editorship of L.A. Buldakov. TsNIIatominform-MZ-1-91, M. 1991, 64 p.

19. Kossenko M.M., Degteva M.O., Petrushova N.A. Assessment of radiation risk for leukemia induction on the basis of population exposure analysis in the South Urals. Informational bulletin of the Academy of Medical Sciences (1991), N 8, p. 23-28.

20. Krestinina L.Yu., Kossenko M.M., Kostyuchenko V.A. Lethal developmental defects in the offspring of the EURT residents. Meditsinskaya Radiologiya, (1991), N 6, p.30-32.

21. Kossenko M.M., Degteva M.O. Assessment of radiation risk for the population exposed due to discharges of radioactive wastes into the river Techa. Atomnaya Energiya (1992), vol. 72, issue 4, p. 390-395.

22. Kossenko Mira M., Marina O. Degteva, Nelly A. Petrushova. Estimate of the risk of leukemia to residents exposed to radiation as a result of a nuclear accident in the Southern Urals. Physicians for Social responsibility (The PSR Quarterly) (1992), vol. 2, No 4, p. 187-197.

23. Kossenko M.M. Analysis of respiratory organs pathology exposed to radiation in the South Urals. Pulmonologiya, (1993), N 4, p. 70-77.

24. Kossenko Mira M., Marina O. Degteva. Cancer mortality and radiation risk evaluation for the Techa river population. The Science of the total Environment, 142 (1994), p. 73-89.

25. Kossenko M.M., Izhevsky P.V., Degteva M.O. et al. Pregnancy outcomes and early health status of children born to the Techa river population. The science of the Total Environment, 142 (1994), 91-100.

26. Kostyuchenko V.A., Krestinina L.Yu. Long-term irradiation effects in the population evacuated from the East-Urals radioactive trace area. The Science of the Total Environment, 142 (1994), 119-125.

27. Degteva M.O., Drozhko E, Anspaugh L.R. et al. Dose Reconstruction for the Urals Population. Lawrence Livermore National Laboratory UCRL-ID-123713. Submitted to the U.S. Department of Energy, February, 1996.

28. Breslow NE and Day NE (1987). Statistical Methods in Cancer Research, Vol II. The Design and Analysis of Cohort Studies. Lyon: IARC.

Appendix A - Urals Research Center for Radiation Medicine (URCRM) Hard Copy Information Inventory

I. Archive Contents

The Urals Research Center for Information Radiation Medicine (URCRM) has collected radiation health effects data on inhabitants exposed to radiation incidents in the Southern Urals region of the Russian Federation. In particularly, disease incidence, birth and mortality rates of exposed individuals were sporadically collected within different scientific and practical projects; therefore, its completeness varies. For example, death certificates were collected through 1992 for five districts of the Chelyabinsk Region affected by radiation incidents. For two districts of the Kurgan Region, death certificates were available only to 1982. Practically all birth certificates have been collected for children born to parents who were exposed to radiation from the Techa contamination who remained in the Chelyabinsk Region. Data for those exposed to radiation from the 1957 East Urals Radioactive Trace (EURT) are available to 1988. All hard copy information available at URCRM can be divided into one of the four groups listed below:

1. **Unique information (only available at URCRM):**
   outpatient medical charts
   case histories
   tissue sample logs
   myelogram registration logs
   radiochemical and dosimetric measurements card files
   leukemia patient card files

2. **Information for compiling registries collected by URCRM staff from different sources**
   Techa registry card files
   EURT registry card files
   oncological patient card files
   oligophrenia, schizophrenia, epilepsy and Down's syndrome patient card files
   card files for patients with congenital defects and inherited diseases
   registries of twins of the Kurgan Region
   census logs of resettled population (late 1960's-1970's)

3. **Registry information obtained from other organizations**
   photocopies of resettled population lists
   photocopies of tax books

4. **Background information for follow-up of migration, mortality and birth rates**

photocopied lists of people exposed to radiation (Mayak and Techa incidents) who received exposed population certificates
handwritten copies and photocopies of death certificates
handwritten copies of birth certificates

Table 1 (page B-3) summarizes the documents that form the URCRM archive.

An additional 4,000 photocopies of death certificates between 1983-1988 for two districts of the Kurgan Region were added to the URCRM archive. Also, 22 tax books archived in the Casley Regional Archive were photocopied. Lists of people who received exposed population certificates from social protection centers of five districts of the Chelyabinsk Region, seven metropolitan districts of the city of Chelyabinsk and regional social protection centers of the Chelyabinsk and Kurgan regions were also photocopied.

II. Description of Archival Document Information Outpatient Charts

Two types of outpatient charts included are individual outpatient charts (25 208 x 152 mm sheets), and a medical book (130 248 x 168 mm sheets). The cover sheet contains the patient's systemic number, last and first names and patronymic names, dates of birth, place of major exposure and current address. (Occasionally whole body counter measurement results are also included.) Doctor and other specialists record any changes on the charts while results of laboratory analyses and counts are attached to the chart.

Table 1. Documents Forming the URCRM Archive

Number	Description	Quantity
1	Outpatient charts including: EURT cohort; Techa cohort; Hematological; Miscellaneous	
2	Case histories (folders)	13,638
3	Tissue sample logs	9
4	Myelogram registration logs	7
5	Lifetime radiochemical and dosimetric measurements cards	~12,500
6	Card file for leukemia and chronic radiation sickness patients	~300
7	Techa registry cards	65,000
8	EURT registry cards	4,651
9	Oncological patients cards	17,100
10	Cards for oligophrenia, schizophrenia, epilepsy and Down's syndrome patients	3,976
11	Cards for patients with congenital defects and hereditary diseases	750
12	Kurgan Region twins registry (cards)	819
13	Census logs of villages with resettled populations	052
14	Photocopies of tax books	22
15	Photocopies of the following lists: - resettled population (according to Mayak data) - children in orphanages - prospecting parties	 1,392 1,419 1,166
16	Handwritten copies and photocopies of death certificates for Chelyabinsk Region (Argayash, Krasnoarmeisk, Kunashak and Sosnovka Districts) and for Kurgan Region (Dolmatov and Kataisk Districts)	~107,000
17	Photocopied lists of people exposed to radiation (Mayak and Techa incidents) who received exposed population certificates	3,100
18	Handwritten copies of birth certificates	4,100

A formalized outpatient chart (FOC) contains the patient's passport data, place and dates of major exposure, previous addresses, current address, family history, diagnosis, and indexes of medical examinations. The outpatient charts are ordered by major exposure villages and within the villages by systemic numbers.

Case History for Hospital Patients

Case histories are stored in 315 x 235 mm folders. The title page of the folders includes the archival number, the systemic number, and last, first and patronymic names. Case histories are enclosed on 36 sheets (293 x 210 mm, 20 mm thick). The title page of each case history has an archival number, annual registration number, last, first and patronymic names, date of birth and sometimes a current address. Also included in the case history are admittance and discharge dates passport data, initial and final diagnoses, analysis and objective examination results, prescriptions, epicrisis, and the doctor in charge.

Tissue Sample Logs

There are two sizes of tissue sample logs: (1) 125 sheets (295 x 200 mm), and (2) 60 sheets (375 x 275 mm). The log is designed for registration of osseous and hematopoietic tissues and trepanobiopsy. Included in this log are ordinal numbers, the patient's last, first and patronymic names, date of birth, systemic number, addresses (if available), date of sampling, preparation number and the analysis result.

Myelogram Registration Log

The myelogram registration logs are in three sizes: (1) 500 sheets (210 x 294 mm); (2) 125 sheets (295 x 200 mm); and (3) 125 sheets (280 x 205 mm). These logs include ordinal number (general and from the beginning of the year), sampling dates, last, first and patronymic names, systemic number (if in the exposed population inventory), the year of birth, and analysis results.

Life-Time Radiochemical and Dosimetric Measurements Card File

This card file contains 210 x 150 mm cards which include the systemic number, last, first and patronymic names, date of birth, gender, place and time of major exposure, date and results of whole-body counter measurements (^{137}Cs, ^{40}K, and ^{90}Sr count in the whole body), forehead sensor measurement results, and ^{90}Sr count in teeth. If radiochemical analysis of excretions was done, the type, the date of sampling and the analysis result are given.

Card File for Leukemia and Chronic Radiation Sickness Patients

This card file is composed of 210 x 150 mm cards that includes last, first and patronymic names, systemic number, and place and time of major exposure. Occasionally, a relative's name and address may be given. Additional information listed on each card are last address, diagnosing year, year the patient's name was removed from the registry, blood count results, and whole body counter measurement results. If the person is dead of death, cause of death, and radiation dose are shown.

Techa Registry Card File

The Techa registry card file is composed of 124 x 74 mm cards. Recorded in the top, left-hand corner are the last, first and patronymic names, closest relatives (mother, father and spouse) and their exposure locations corner. In the top, right-hand corner, the patient's former residences are shown by the year and place of major exposure and the year the patient was resettled or moved. The last entry is the patient's current address. The patient's date of birth and systemic number (in red ink) are written at the top center of the card. Information on the outpatient-patient medical examinations and the whole body counter measurements with their respective dates are given in the bottom left-hand corner.

EURT Registry Card File

This card file is composed of individual 206 x 147 mm cards. The front top center contains the name of the settlement and the family number. The years the family lived in the village, taken from tax books, are written in pencil the top, right-hand corner. All the family members are listed on the card beginning with the head of the family with their date of births and dates of death. The availability of the death certificate is shown and the coded cause of death (according to International Classification of Diseases, Revision 9 - ICD-9). If a family member (or the entire family) moved to another village, the name of the new village and the year moved in, are also shown.

Card File for Oncological Patients

The oncological patient card file is composed of individual 125 x 75 mm cards. Shown on the front of the card are last, first and patronymic names, systemic number (if the patient is part of an exposed population registry), diagnosis date, the diagnosis, vital status, and address.

Card File of Oligophrenia, Schizophrenia, Epilepsy and Down's Syndrome Patients

The above card file is composed of individual 190 x 80 mm cards (for oligophrenia and schizophrenia patients) and 95 x 80 mm cards (for patients with Down's syndrome). The front of each card includes the last, first and patronymic names, year of birth, systemic number (if included in the registry of exposed people), address, diagnosis, obstetrical history, parental information (their last, first and patronymic names and years of birth).

Card File of Patients with Congenital Defects and Hereditary Diseases

This card file is composed of individual 95 x 80 mm cards. The front of the card shows last, first and patronymic names, year and place of birth, systemic number (if on the registry of exposed population), parents' passport data, any diagnosis and medical examination results.

Kurgan Region Twin Registry

The Kurgan Region Twin Registry consists of 205 x 150 mm cards. The front of the card includes the last, first and patronymic names of each twin, dates of birth, information about the parents including their systemic numbers (if in the registry of exposed population) and the place of major exposure.

Census Log

The census log is a 125 page (207 x 300 mm) book. The title page includes the name of the village and the ordinal number. The population is listed by families with the head of the family noted and how other family members are related. Date of birth, previous addresses, current address and information about relocation are also shown in the census log. (Few logs contain alphabetized entries.)

Photocopies of Tax Books

These tax books were photocopied on 210 x 297 mm paper then bound into books. Labels show the name of the village, census year, streets and the district archive in which the book was photocopied. The first page is a photocopy of the original title page of where the village or the village council is shown, years of completing the book, the ordinal number originally assigned in the village in the year the census was started, and the street where the census was taken. Each photocopy contains information about the head of the family and all the family members with their last, first and patronymic names. date of birth, date of death,

ethnic identity, education, social status, moving information, military service, and education.

Resettled Population List (Techa Contamination)

This list is formatted on 302 x 222 mm paper. On the title page, villages are listed by districts and regions. Each entry has an ordinal number, the resettled person's last, first and patronymic names, and number of family members. The amount of monetary compensation, the availability and place of archiving the estimated value of the family personal belongings are also included.

Resettled Population List (MAYAK Accident)

Formatted on 306 x 222 mm paper, this list shows settlements on the title page by districts and regions. Each entry has an ordinal number, last, first and patronymic names of the resettled person, year of birth, job affiliation and position at the time of resettlement, availability and place of archiving of the estimated value of the family and personal belongings.

List of Children in Orphanages

On 295 x 210 mm paper, this list shows the name of the orphanage and the year the list was compiled on the title page. The list also shows last, first and patronymic name, year a child moved to an orphanage, when a child was moved, and the name of the new orphanage.

Copies of Death Certificates

There are two types of death certificate copies: handwritten and photocopies. There are four types of handwritten copies of death certificates:

1. Formatted on 150 x 150 mm paper these death certificates include ordinal or systemic number (if the patient's name is in the registry of exposed population), last, first and patronymic names, date, cause and coded cause of death, last address (if there is a systemic number, the place of major exposure), a doctor's or paramedic's statement, and informant.

2. These death certificates are formatted on 210 x 145 mm paper and include the ordinal or systemic number (if the patient's name is included in the registry of exposed population), last, first and patronymic names, date of birth, date of and death, gender, systemic number, place of major exposure, place of death, informant (autopsy record, death certificate, and so forth), cause of death, and coded diagnosis.

3. Formatted on 300 x 220 mm paper these death certificates contain ordinal or systemic number (if the patient is included in the exposed population registry), last, first and patronymic names, date of birth, date of death, gender, and if there is a systemic number, places of major exposure, place of birth, place of death, education, employment, sources of information (autopsy record, death certificate or other), the cause of death, coded diagnosis, and informant.

4. These dearth certificates are formatted on 190 x 805 mm paper that include systemic number (if the patient is included in the exposed population registry), last, first and patronymic names, date of death, cause of death, coded cause of death, and the last address.

Photocopies of death certificates are on 210 x 297 mm sheets. Each photocopy contains the ordinal number, last, first and patronymic names, ethnic identity, date, place and cause of death, date and place of birth, place of permanent residency, marital status, job affiliation and profession, education, death statement, the informant's last, first and patronymic names and address.

Exposed Population Certificate List

Photocopies are made on 210 x 297 mm paper. The seal of the district administration head where exposed population certificates were issued is imprinted on the top right-hand corner along with his signature and the date. The name of the village in which the patient lived at the time of the accident is shown in the middle of the page. The list contains last, first and patronymic names, date of birth, the period lived in the village and evacuation period, the certificate serial number and date of issue, on what basis it was issued, current address and signature. Shown at the end of each list is the seal of the manager of the social protection center and his signature along with the signature of a specialist of the same center where the certificate was issued.

Birth Certificate Copies

Copies of birth certificates are individual handwritten cards (190 x 80 mm). Each card has the last, first and patronymic names, place and date of birth, last, first and patronymic names of the patient's father and mother with their systemic numbers.

III. Sources for Updating Information

The information system is updated when a patient visits the outpatient department of the URCRM. The receptionist asks the patient about his passport data, when he lived on the Techa, his current address, education, job affiliation, job exposure, and risk factors. The patient is also asked about family history (parents, siblings, spouse and children). An FOC is completed as a result and if the information has already been entered, it is verified and updated. An oncological screening form is also completed.

The patient is then analyzed in the clinical laboratory where he also undergoes measurements by the whole body counter. Women are required to see a gynecologist for an examination. The gynecologist then completes the pertinent sections of the FOC (gynecological status, pregnancy and child birth) and the oncological screening form. The patient is also examined by another doctor who enters the diagnosis on the FOC diagnosis section. If the patient is hospitalized, the doctor in charge completes this section.

Medical examinations of the populations of the five districts of the Chelyabinsk Region and the two districts of the Kurgan Region are regularly completed by URCRM staff. Queries, similar to those used when the patient visits the outpatient department, are also completed during these examinations. Information, therefore, is annually updated for ~4,000 people because of visits to the outpatient department and through local medical examinations.

To follow global indexes as migration, death and birth rates, it was decided information will be collected regularly through regional addresses and ZAGS offices. Another source of information are tax books for villages whose population was evacuated. In addition, a 1994 law was enacted on the social protection of radiation-exposed population because of an accident at PA MAYAK and on account of a radioactive release into the Techa. Because of this law, issuing certificates to exposed populations began.

The criteria for determining what populations would receive these certificates is described below.

Chelyabinsk Region

1. People presently living in villages of the five exposed districts (in district social protection offices).

2. People presently living in the city of Chelyabinsk (in seven metropolitan district social protection offices of Chelyabinsk).

3. People who lived in the contaminated area of the Chelyabinsk Region and who presently live in other districts and towns of the Chelyabinsk Region and outside the Chelyabinsk Region (in the regional protection office).

Kurgan Region

1. People who lived in the contaminated area of the Kurgan Region (in the regional office of social protection).

Sverdlovsk Region

1. People who lived in the EURT evacuated villages (in the EURT Administration).

After evaluating our resources and the significance of the information collected for research and practical activities carried out by other departments of URCRM, we collected the following information.

Migration

Lists of people who received exposed population certificates (Techa or Mayak incidents) were photocopied in the respective offices of the Chelyabinsk and Kurgan Regions. An electronic copy of such lists was received from the Sverdlovsk Region.

Mortality Rate

Death certificates for the years 1983-1989 were photocopied for two contaminated districts of the Kurgan Region.

Refining EURT Registry

Tax books for villages exposed to the 1957 radiation release (stored in the Casley archive) have been photocopied.

Appendix B - URCRM Data Base

I. Description of the Data Base

Currently, there is a Unified Information Data Base (DB MAN) available. The DB MAN is a relational type data base and it consists of individual indexed relations integrated through relationships from primary and secondary keys. The main keys, which relate the registries, are systemic numbers. The systemic numbers are unique and have error protection coding. For example, if a patient is assigned a wrong systemic number (the same person is assigned two different systemic numbers and is listed twice) and the error is detected, one number is permanently deleted. (The DB MAN registries and their relationships are shown in Figure 1.)

Identification Registry

The Identification Registry is the core of the DB MAN. It contains a set of attributes characterizing each individual and its association with radiation situations on the Techa and in the EURT area.

Strontium Registry

The results of the ^{90}Sr measurements in the whole body, teeth, frontal bone, and urine are stored in the Strontium Registry.

Diagnosis Registry

The Diagnosis Registry was formed based on the results of many years of medical examinations.

Family History Registry

The Family History Registry includes information from tax books and FOCs arranged by family cells. This registry is necessary for evaluating individual dose loads by the method of "family ecology" and for estimating genetic risk. It includes systemic numbers, relationship codes, and the systemic number of a relative. The registry is supplied with a program of data entry analysis. For example, if entry of a child's first or patronymic name is incorrect, the computer alerts the user.

Dead People Registry

This registry includes first and last names, date of birth, date of death, place of death, and cause of death for five districts of the Chelyabinsk Region (Argayash, Casley, Krasnoarmeysk, Kunashak, and Sosnovka) and two districts of the Kurgan Region (Dolmatov and Kataisk). It also contains information for the people exposed to radiation because of the Techa contamination and the 1957 accidents, and the control group (people who were not exposed to radiation in these incidents but lived in those districts).

Other Information

Besides the main registries the computer data base includes the following information:

- cancer registry
- peripheric blood count
- biochemical blood count
- immunological data
- neurological status
- physical development
- everyday life risk factors
- occupational risk factors
- job affiliation
- gynecological history
- pregnancy history
- therapeutic status

II. Completion and Correction of Data Base

Identification Registry

As part of this project, all of the registry information (except the current address) was verified and corrected using reference books of first and last names and settlements that made it possible to maintain random error protection. This was possible because of a new computer program called "Patient Identification" which was developed with an ongoing project of the URCRM Biophysical Laboratory entitled "Improvement of the Unified Information System "Radiation Situation and Population Health in the Area of PA Mayak."

Code reference manuals are presently used for data entry control. This eliminates data entry errors and their redundancy, therefore, speeding up data entry. It also ensures information reliability and eliminates inconsistencies. When encountering the problem of reading the person's last and first names (especially if the person is a Tartar or a Bashkir), the operator can use the reference book and enter the verified information in the registry. The code reference book of exposed settlements makes it possible to enter information for only seven districts under investigation. Such lines as status, status year and cohort are protected from arbitrary entry by the following phrases: alive because somebody said so, dead because somebody said so, or dead with a certificate. The date of the end of the period a person lived in a village is limited by the year of relocation. For example, if the person lived in Metlino, the reference value list "will not allow" to record any year following 1956.

Strontium Registry

Information for this registry is entered, checked and corrected by the staff of the URCRM Biophysical Laboratory. To do this, a computer program, "Whole Body Counter Operator," was developed.

Diagnosis Registry

The URCRM Epidemiologic Department is responsible for diagnosis coding, data entry and correction. To do this work, a computer program "Diagnosis" was developed. Information for this registry is taken from all outpatient cards of the URCRM reception office by the diagnoses shown. The diagnosis reference book is a computerized version of the International Classification of Diseases, Revision 9 (ICD-9).

This registry has information for all people born in 1949 and prior for all the villages of the Chelyabinsk Region being studied. Information for progeny is introduced for Asanovo, Ibragimovo, Isayevo, Kurmanovo, S. Taskino, Metlino, Muslumovo, Nadirov Most, Nadirovka, and Techa-Brod.

Family History Registry

Three URCRM subdivisions are responsible for data entry, its checking and introducing corrections:

1. DB Information Support Group
2. Biophysical Laboratory
3. Epidemiologic Department

A computer program "Genealogy" was developed in the URCRM Biophysical Laboratory to support this task for the ongoing project "Improvement of the Unified Information System Radiation Situation and Population Health in the Area of PA Mayak." Information is added to this registry from archival materials (outpatient charts, the Techa Registry card file, and the EURT Registry card file). Information is introduced by settlements where the patient was exposed to radiation. This registry has been completed for the following settlements: Asanovo, Gerasimovka, Ibragimovo, Isayevo, S. Taskino, Metlino, Muslumovo, Muslumovo (railway station), Nadirov Most, Nadirovka, Osolodka, Panovo, Geologorazvedka, Techa-Brod, and Cherepanovo.

Death Registry

The Data Base Information Support Group and Epidemiologic Department staff are responsible for coding causes of death, data entry and introducing corrections. There is a computer program entitled "Patient Identification" for this purpose. The verification of the dead people registry has been started. Verification of 81% (12,222 cases) of the population exposed to radiation on the Techa (Techa Registry) has been completed.

Other Information

The computerized data base has a 12-file structure (see Section I). The information (except the Cancer Registry) is updated from FOCs in a semiautomatic mode when the patient visits the URCRM Outpatient Department. The Cancer Registry includes information on 18,057 patients of the Chelyabinsk and Kurgan regions obtained from the regional oncological centers (first and last names, date of birth and date of diagnosing the tumor and its type). It is updated by the Epidemiologic Department staff in a semiautomatic mode.

III. Computerized Data Base Status (through December 1995)

Information on the main registries of the data base is summarized in Table 1. The registries were completed (Section II) and all available data (passport and residence information) have been included in the Identification Registry. The current address information is 80% complete. The Strontium Registry (100% complete) is automatically updated when the patient undergoes dosimetric measurements. The Family History Registry is 44% complete while the completeness of the "Diagnosis" and the "Dead People" registries have not been determined. Information transfer from archival documents to the Registry Diagnosis has not been completed. Not all death certificates (Death Registry) have been collected for two districts of the Kurgan Region (since 1983) and for the Chelyabinsk Region (since 1993). (Table 2 contains modification information introduced into the data base other files.)

Table 1. Status of the Main Registries

No.	Registry	Number of Records	Percent Verified
1	**Identification:**		
	- passport data	90,945	100
	- places of exposure	87,974	100
	- last address	58,355	not verified
2	Strontium	53,475	100
3	Diagnosis	160,789	100
4	Family History	39,544	100
5	All deceased including:	110,675	
	- Techa Registry	15,029	81
	- EURT Registry	4,542	not verified

Since death certificates were no longer collected for two districts of the Kurgan Region, there is a sharp decrease in death information in the Techa cohort. Photocopying of death certificates organized in the Kurgan Regional ZAGS will allow more accurate information. Organizing death certificate collection for the Chelyabinsk Region beginning with 1993 and every year after is also necessary. As mentioned above, we are planning to organize a regular collection of mortality data from regional ZAGS archives. A significant amount of death information was obtained from relatives that create problems in correlating risk of death with exposure level. We are planning, therefore, to search for death certificates of deceased individuals whose relatives have verified are dead.

Table 3. Amount of Information in Data Base Other Files

No.	Records	Number of Records		Data Changes for Two Years
		Dec. 1993	Dec. 1995	
1	Cancer Registry	13,940	18,057	4,117
2	Peripheral Blood Count	45,013	50,427	5,424
3	Biochemical Blood Count	4,538	4,538	0
4	Immunological Data	621	1,906	1,285
5	Neurological Status	4,693	7,383	2,690
6	Physical Development	17,730	17,732	2
7	Risk Factors: everyday Life	11,050	11,444	394
8	Occupational	10,114	10,433	319
9	Job Affiliation	12,302	12,603	301
10	Gynecological Status	930	930	0
11	Pregnancy History	6,577	6,577	0
12	Therapeutic Status	7,351	7,609	258

Figure 1. Data Base "MAN"

III. Identification Registry
1. **Systemic Number**
2. Gender
3. Last Name
4. First Name
5. Patronymic
6. Ethnic Identity
7. Place of exposure (Techa, EURT)
8. Date of birth
9. Places & dates lived in place of exposure
10. Last known address

II. Diagnosis Registry
1. **Systemic Number**
2. Examination Date
3. Examination conditions (field, outpatient department, hospital)
4. Diagnosis (ICD-9)

I. Registry of Measurements of Radioactivity in the Whole Body
1. **Systemic Number**
2. Measurement Date
3. ^{137}Cs Count
4. K Count
5. ^{90}Sr Count
6. β-activity of teeth
7. β-activity of frontal bone

IV. Family History Registry
1. **Systemic Number**
2. Father
3. Mother
4. Spouse
5. Siblings
6. Children

V. Dead People Registry
1. **Systemic Number**
2. Date of Death
3. Age at Death
4. Education
5. Profession
6. Source of information about death
7. Cause of Death (ICD-9)

Appendix C - Curriculum Vitae

Name: Mira M. Kossenko
Birth Date: 16 January, 1937
Birth Place: Magnitogorsk, Russian Federation
Citizenship: Russian Federation
Marital Status: Married

Education:

1983 Radiation Special Course for heads of Radiation Medicine Departments, Moscow, USSR
1973 Clinical Special Course at the Advanced Medical Training Pharmacology, Moscow, USSR
1966 Internal Diseases Department Medicine, Chelyabinsk Medical Institute, Chelyabinsk, USSR
1961 M.D., Chelyabinsk Medical Institute, Chelyabinsk, USSR

Employment:

1991 - Present	Head, Epidemiology Laboratory Urals Research Center for Radiation Medicine (formerly Branch Number 4, Institute of Biophysics) Chelyabinsk, Russian Federation
1986 - 1987	Scientific Advisor on Chernobyl problems, Byelorussia and Ukraine Health Ministries
1983 - 1986	Head, Clinical Department, Urals Research Center for Radiation Medicine, Chelyabinsk, USSR
1967 - 1983	Researcher, Clinical Department, Branch 4, Institute of Biophysics, Chelyabinsk, USSR
1966 - 1967	Clinician, Department for radiation Exposed People Chelyabinsk, USSR
1961 - 1964	Family physician, Family Doctor Service System, Chelyabinsk, USSR

Professional Membership:

Russian Scientific Committee on Radiation Protection (RSCRP)
Scientific Board on Radiobiology of the Russian Academy of Sciences
Scientific Council of the International Sakharov Radioecology College
Scientific Council, Radioecology Department, Central European University

Presentations at International Conferences:

1990 Japan-USSR Seminar on radiation effects research, Tokyo-Japan
1992 USA-Russia Workshop on radiation risk assessment at University of California, Davis, USA
1992 Seminar on health effects in radiation accidents, Harvard University, USA
1993 Annual Meeting of Radiation Protection Society, Ruegen Germany
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Publications:

Book Chapters

1. L.A. Ilyin, M.M. Kossenko (eds). Manual for organizing medical services for the population exposed to ionizing radiation. Moscow. 190 pp. 1987, (in Russian)
2. Saurov M.M., G.I. Gneusheva. M.M. Kossenko. Demographic research in radiation hygiene. Moscow, 1987. 226 pp. (in Russian)
3. Buldakov L.A. Radioactive contamination of the environment in the Southern Urals region and its impacts on the human health. Moscow, 1991. 64 pp. (in Russian)

Papers

1. Mira M. Kossenko, M.O. Degteva, N.A. Petrushova. Leukemia risk estimate on the basis of nuclear incidents in the Southern Urals. Proceedings book of the Japan-USSR Seminar on radiation effects research held in June, 1990, Tokyo, Japan. P. 37-49.

2. Krestinina L.Yu., M.M. Kossenko, V.A. Kostyuchenko. Lethal developmental defects in the offspring of the residents of the radioactive trace zones. Meditsinskaya Radiologiya, 36:2, 1991. pp 32 (in Russian).

3. Valery Soyfer, Marina Degteva, Mira Kossenko, Alexander Akleyev, Nina Yakovleva-Soyfer, Ghennady Romanov. Radiation accidents in the Southern Urals (1949-1967) and their impacts. Problems of Southern Europe, pp.\ 33-34, Washington, 1991, pp. 226-265 (in Russian).

4. Mira M. Kossenko, Marina O. Degteva, Nelly A. Petrushova. Estimate of the risk of leukemia to residents exposed to radiation as a result of a nuclear accident in the Southern Urals. PSR Quarterly, 2, 187 (December, 1992).

5. Kossenko M.M., Degteva M. O. Estimates of radiation risk for the population exposed as a result of releases of radioactive waste into the river Techa. Atomnaya Energiya (Atomic Power), Vol. 72, issue 4, 1992. P. 390-395 (in Russian).

6. Petrushova N.A., Zvereva G.I., Kossenko M.M., Degteva M.O. Cytogenetic studies in the population exposed due to radioactive waste discharges into the River Techa. Meditsinskaya Radiologiya, V. 38, N 2, 1993. P. 35-37 (in Russian).

7. Mira M. Kossenko, Marina O. Degteva. Cancer mortality and radiation risk evaluation for the Techa River population. The Science of the Total Environment, 142 (1994), 73-89.

8. M.M. Kossenko, P.V. Izhevsky, M.O. Degteva -, A.V. Akleyev, O.V. Vyushkova. Pregnancy outcome and early health status of children born to the Techa River population. The Science of the Total Environment, 142, (1994), 91-100.

9. M.M. Kossenko. Comparative characteristics of radiation accidents with population exposures. Radiation Protection Dosimetry. V. 62, No 1/2, pp. 87-89, 1995.

10. A.V. Akleyev, M.M. Kossenko, L.A. Silkina, M.O. Degteva, A. Awa, M. Akiyama, G.A. Veremeyeva, A.V. Vozilova, S. Kyozumi, V.P. Kozheurov, O.V. Vyushkova. Health effects of radiation incidents in the Southern Urals. Stem cells, 1995; V. 13, (Supplement 1), pp. 58-68.

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Education:

1956 Chelyabinsk Pedagogical University
1965 Advanced Training Department, Leningrad University

Employment:

1988 - Present	Chief, International Collaboration Section, URCRM
1965 - 1988	Senior lecturer in medical terminology and English, Chelyabinsk Medical Academy

Scientific Interests: terminology, lexicography

Relevant Publications:

1. A.V. Akleyev, C.M. Zhidkova. Environmental issues too much ignored. New Solutions. V. 4, No. 2, 1994.

2. A.V. Akleyev, C.M. Zhidkova. Current Russian legislation on intellectual property and its implications for international scientific collaboration involving URCRM data base. Health Physics. In press.

Name: Lioudmila Krestinina
Birth Date: 12 March 1955
Birth Place: Chelyabinsk, Russia
Citizenship: Russian Federation
Marital Status: married

Address:

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Education:
1979 Medical Institute, Chelyabinsk, Russia

Employment:

1987 - Present Researcher, Epidemiology Laboratory, URCRM

1980 - 1987 Children's allergologist, City Children's Polyclinic No 5

Field of Interest: radiation epidemiology, carcinogenic and genetic effects, risk assessment

Presentations at International Conferences:

January, 1995	International Symposium: Chronic radiation Exposure: Risk of Late effects, Chelyabinsk, Russia
September, 1995	INTAS international conference "Impacts of Technologic Civilization on the Environment", Moscow, Russia
May, 1995	International conference on late effects of Chernobyl accident, Moscow, Russia
July, 1995	2nd Workshop "Studies of Radiation Effects on the population of the Urals and other Regions", St. Petersburg, Russia

Publications:

1. Buldakov L.A., Dyomin S.N., Kossenko M.M., Kostyuchenko V.A., Koshurnikova N.A., Krestinina L.Yu., Saurov M.M., Ternovsky I.A., Tokarskaya Z.B., Shvedov V.L. Health effects of radiation accident of 1957 in the South Urals. Recov. Oper. Event Nucl. Accident Radiol. Emergen.: Proc. Int. Symp., Vienna, 6-10 Nov., 1989-1990, p. 419-431.

2. Krestinina L.Yu. Kossenko M.M. Kostyuchenko V.A. Lethal developmental defects in the progeny of population residing on the radioactive trace territory. Journal of "Meditsinskaya Radiologiya", 1991, No 6, pp. 30-32.

3. Kostyuchenko V.A., Krestinina L.Yu. Long-terrm radiation effects in population evacuated from the East-Urals Radiation Trace area. Journal of the Total Environment, No 142 (19940, pp. 119-125.

4. Krestinina L.Yu., Kostyuchenko V.A. Analysis of long-term carcinogenic effects of radiation exposure on the population residing in the EURT area. Proceedings of the Conference "Problems of Health rehabilitation for Population exposed to radiation", Yekaterinburg, 26-27 May, 1994, pp.19-26.

5. Krestinina L.Yu., Kostyuchenko V.A.. Analysis of health effects due to population exposure on the territory of the East-Urals Radiation Trace. Book of Abstracts, CIS-Japan Symposium "Problems reconstruction of individual doses resulting from large-scale radiation accidents and radiation risk estimation", Moscow, 1994.

6. Krestinina L.Yu., Kostyuchenko V.A. Analysis of long-term effects of population exposures on the territory of the East-Urals Radiation Trace. Book of Abstracts, International Symposium "Chronic Radiation Exposure: Risk of Late Effects", Chelyabinsk, 1995.

7. Kostyuchenko V.A., Krestinina L.Yu. Long-term effects of radiation exposure for population evacuated from the EURT territory. Journal of "Meditsinskaya Radiologiya i Radiatsionnaya Bezopasnost", 1995, No 1. V. 40.

Name: Nadezhda Gudkova
Birth Date: 1960
Birth Place: Chelyabinsk, Russian Federation

Education:
1984 Chelyabinsk Medical Institute
1985 Special course in internal diseases

Employment:

1991 - present	Researcher, Epidemiology Laboratory, URCRM
1984 - 1991	Family Physician, Family Doctor Service System, Chelyabinsk

Field of interest: studies of leukemia morbidity for exposed child population, comparative studies of death rates

Publications:
Paper: Leukemia in the offspring of exposed parents. In the Journal "Meditsinskaya Radiologiya" (in press).

Name: Yevgeniya Ostroumova
Birth date: 1971
Birth Place: Chelyabinsk, Russian Federation

Education:
1994 Chelyabinsk Medical Institute
1995 Special course in Pediatrics

Employment:
1995 - present Researcher, Epidemiology Laboratory, URCRM
1992 - 1994 Laboratory technician, URCRM

Field of interests: assessment of long-term exposure to radiation, genetic and carcinogenic effects.

Name: Lydia Nikolayenko
Birth Date: 1941
Birth Place: Chelyabinsk

Education:
1958 Medical school, Chelyabinsk
1967 Pedagogical Institute, Department of Mathematics
1993 Special course in biostatistics

Employment:

1971- present	Data Base Manager, URCRM
1968-1971	Senior Laboratory Technician, URCRM
1958-1962	Medical Nurse, URCRM (former Branch 4, Biophysics Institute)

Field of interest: data base management, problem file formation, quality control, variant statistics models

Publications:
Co-author: Risk of cancer development for the population exposed in the Techa riverside communities. Proceedings of the International Symposium "Chronic radiation Exposure: Risk of Late Effects", Chelyabinsk, 1995, and other papers.

Name: Svetlana Nizhegorodova (Epifanova)
Birth Date: 1963
Birth Place: Chelyabinsk, Russian Federation

Education:
1985 Chelyabinsk Polytechnical Institute, Department of Programming
1993 Special course in biostatistics

Employment:
1993 - present Programmer, URCRM
1985 - 1993 Programmer, Computation Center, URCRM, Chelyabinsk

Field of interests: organization of relational-type data bases, software for data base management, utilization of AMFIT and other software

Publications:
Co-author of the paper: Risk of cancer development for the population exposed in the Techa riverside communities. Proceedings of the International Symposium "Chronic radiation Exposure: Risk of Late Effects", Chelyabinsk, 1995, and other articles.

Name: **Terry Lynn Thomas**

DATE/PLACE OF BIRTH: April 13, 1948; Belleville, IL

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EDUCATION:

Location	Dates of Attendance	Degree
College of William & Mary, Williamsburg, VA	09/66 - 06/68	n.a.
University of Colorado, Boulder, CO	09/68 - 08/70	**B.A.** (Sociology)
Georgetown University, Washington, DC	09/75 - 02/77	**M.S.** (Biostatistics)
Johns Hopkins University School of Hygiene & Public Health, Baltimore, MD	09/82 - 10/86	**Ph.D.** (Occupational Health)

EMPLOYMENT RECORD:

06/71 - 04/73 - Statistical Assistant, GS-7, **NIH, National Cancer Institute,** DCCP, Epidemiology Branch, Bethesda, MD 20892

04/73 - 06/78 - Sociologist, GS-7, GS-9, **NIH, National Cancer Institute,** DCCP, Epidemiology Branch, Bethesda, MD 20892

06/78 - 06/87 - **Epidemiologist**, GS-9, GS-11, GS-12, **NIH, National Cancer Institute,** DCE, Environmental Epidemiology Branch, Occupational Studies Section, Bethesda, MD 20892

06/87 - 04/88 - Health Systems Specialist, GM-13, **Veterans Administration,** Department of Medicine and Surgery, Office of Quality Assurance, Washington, DC 20420

09/89 - 12/89 - **Associate Professorial Lecturer** in
01/91 - 04/91 Environmental Health Science, Department of Environmental Health Science, The George Washington University, Washington, DC 20052 (Part-time faculty position), Course Title: ENHE 301 Applied Epidemiology

04/88 - 02/91 - **Epidemiologist**, GS-13, GM-14, **Department of Veterans Affairs,** Veterans Health Services and Research Administration, **Environmental Epidemiology Service**, Washington, DC 20006

02/91 - 05/93 - **Supervisory Epidemiologist**, GM-15, Director, Health Communication and Coordination Division, **Office of Epidemiology and Health Surveillance, Office of Health, U.S. Department of Energy**, Washington, DC 20585

05/93 - 02/94 - **Supervisory Epidemiologist,** GM-15, Director, International Programs, **Office of Health (detail), U.S. Department of Energy,** Washington, DC 20585

02/94 - 03/94 - **Associate Professor**, Division of Epidemiology, Department of Preventive Medicine and Biometrics, F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD 20814

03-94 - Present - **Associate Professor & Director**, Division of Epidemiology & Biostatistics **Director**, Center for Health in Extreme Environments, Centers for Preventive Medicine and Public Health
Department of Preventive Medicine and Biometrics, F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD 20814

HONORS AND AWARDS:

Delta Omega Society (Public Health Honorary) Lifetime Member
Fellow, American College of Epidemiology (since 10/4/88)
Outstanding Performance Awards 1984, 1986, 1989, 1990, 1991, 1992, 1993
Special Contribution Awards 1988, 1989, 1990

TEACHING APPOINTMENTS:

02/94 - Present - **Associate Professor (Tenured)** of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Bethesda, MD

07/90 - 02/94 - **Adjunct Assistant Professor** of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Bethesda, MD

1989 - 1993 - **Lecturer** - Current Issues in Biostatistics and Epidemiology, Division of Biostatistics and Epidemiology, Georgetown University School of Medicine, Washington, D.C.

09/89 - 12/89 - **Associate Professorial Lecturer** in Environmental Health Science,
01/91 - 04/91 Department of Environmental Health Science, The George Washington University, Washington, DC (Part-time faculty position)

01/25/89 - **Guest Lecturer** - "Neuroepidemiology." Clinical Neurotoxicology and Occupational Neurology Course. Johns Hopkins University School of Hygiene and Public Health, Baltimore, MD.

10/28/88 - **Guest Lecturer** - "Epidemiology of Central Nervous System Cancers." NCI Cancer Prevention and Control Academic Program. Rockville, MD.

COMMITTEE ASSIGNMENTS:

USUHS:

Graduate Affairs Committee, Department of Preventive Medicine and Biometrics, March, 1994 - Present.
Ph.D. Admissions SubCommittee, Department of Preventive Medicine and Biometrics, February, 1994 - Present.
Program Review and Evaluation SubCommittee, Department of Preventive Medicine and Biometrics, February, 1995 - Present.
Department of Preventive Medicine and Biometrics Executive Committee, March, 1994 - Present.

OTHER:

Member, **Executive Committee to the Joint Coordinating Committee for Radiation Effects Research, Agreement between the United States and the Russian Federation**, September, 1994 - Present.

Ad Hoc Reviewer, **Clinical Sciences 1, Special Study Section,** Division of Research Grants, National Institutes of Health, February 21, 1995.

Ad Hoc Reviewer, **Epidemiology & Disease Control Study Section Subcommittee 2,** Division of Research Grants, National Institutes of Health, June 8-10, 1994.

Ad Hoc Reviewer, **Epidemiology & Disease Control Study Section Subcommittee 2,** Special Study Section Meeting (AHR-F1), Division of Research Grants, National Institutes of Health, June 8, 1994.

Ad Hoc Reviewer, **Nutritional and Metabolic Sciences Study Section (AHR-M2),** Division of Research Grants, National Institutes of Health, June 7, 1994.

Member, **Interagency Working Group on the Radiation Effects Research Agreement with the Russian Federation**, January, 1993 - September, 1994.

Member, **Office of Environment, Safety and Health Strategic Planning Team,** U.S. Department of Energy, October 12, 1993 - February, 1994.

Office of Environment, Safety, and Health Representative, **Department of Energy Intra-agency Coordinating Committee on the Newly Independent States**, September 1992 - February 1994.

U.S. Co-Leader, Working Group 7.0 on the health and environmental effects of the Chernobyl accident, **Joint Coordinating Committee for Civilian Nuclear Reactor Safety**, July, 1991 - February, 1994.

Member, **U.S. Government Interagency Kuwait Working Party** on developing strategies for dealing with the health effects of the Kuwait oil fires, February - September, 1991.

Ad Hoc Reviewer, **Epidemiology & Disease Control Study Section Subcommittee 2**, Division of Research Grants, National Institutes of Health, October 10-12, 1990.

Participant, **Working Group on the Evaluation of Carcinogenic Risks to Humans of Oil Refining, Crude Oil, and Some Petroleum Fuels**, International Agency for Research on Cancer, Lyon, France, March 1-8, 1988.

National Cancer Institute Representative, **Working Group on the Evaluation of Carcinogenic Risks to Humans of Man-Made Mineral Fibres and Radon**, International Agency for Research on Cancer, Lyon, France, June 16-23, 1987.

Participant, **Study Group on Carcinogenic Risk from Exposure to Silica**, International Agency for Research on Cancer, Lyon, France, March 3-4, 1987. (Co-editor of IARC Scientific Publication No. 97, 1990).

AD HOC REVIEWER FOR THE FOLLOWING JOURNALS:

American Journal of Epidemiology
Annals of Epidemiology
American Journal of Industrial Medicine
Journal of the National Cancer Institute
Journal of Occupational Medicine
American Journal of Public Health
Cancer Research

PROFESSIONAL SOCIETIES:

Society for Occupational and Environmental Health
(Member of Governing Board, 1985-1987)
Society for Epidemiologic Research
American College of Epidemiology
American Public Health Association
Association of Teachers of Preventive Medicine

FUNDED GRANTS:

"The Healthy Worker Effect: Model for Selecting Military Analog Populations," Uniformed Services University of the Health Sciences, Oct 1994-Sep 1995.

"Medical Risks in Military Analog Populations Phase 1: Feasibility Study," Funding Agency - NASA; May 1995 - May 1996.

PUBLICATIONS:

REFEREED JOURNALS

1. Kassan S, **Thomas TL**, Moutsopoulos HM, et al. Increased risk of malignancy in sicca syndrome. **Ann Int Med** 89:888-891, 1978.

2. Decoufle P, **Thomas TL**. A methodological investigation of fatal disease risks in a large industrial cohort. **J Occup Med** 21:107-110, 1979.

3. Blair A, **Thomas TL**. Leukemia among Nebraska farmers: a death certificate study. **Am J Epidemiol** 110:264-273, 1979.

4. **Thomas TL**, Decoufle P. Mortality among workers employed in the pharmaceutical industry: a preliminary investigation. **J Occup Med** 21:619-623, 1979.

5. **Thomas TL**, Decoufle P, Moure-Eraso R. Mortality among workers employed in petroleum refining and petrochemical plants. **J Occup Med** 22:97-103, 1980.

6. Decoufle P, **Thomas TL**, Pickle LW. Comparison of the proportionate mortality ratio and standardized mortality ratio risk measures. **Am J Epidemiol** 111:263-269, 1980.

7. **Thomas TL**, Waxweiler RJ, Crandall MS, et al. Brain cancer among OCAW members in three Texas oil refineries. **Ann N Y Acad Sci** 381:120-138, 1982.

8. Reeve GR, **Thomas TL**, Strassman VF, et al. A proportionate mortality study of an Oil, Chemical, and Atomic Workers Local in Texas City, Texas. **Ann N Y Acad Sci** 381:54-61, 1982.

9. **Thomas TL**, Waxweiler RJ, Moure-Eraso R, et.al. Mortality patterns among workers in three Texas oil refineries. **J Occup Med** 24:135-141, 1982.

10. **Thomas TL**. A preliminary investigation of mortality among workers in the pottery industry. **Int J Epidemiol** 11:175-180, 1982.

11. **Thomas TL**, Waxweiler RJ, Crandall MS, et al. Cancer mortality patterns by work category in three Texas oil refineries. **Am J Industr Med** 6:3-16, 1984.

12. **Thomas TL**, Krekel S, Heid M. Proportionate mortality among corn wet-milling workers. **Int J Epidemiol** 14:432-437, 1985.

13. **Thomas TL**, Waxweiler RJ. Brain tumors and occupational risk factors: a review. **Scand J Work Environ Health** 12:1-15, 1986.

14. **Thomas TL**, Mason TJ, Beaumont JJ, et al. Development of a computerized occupational referent population system (CORPS) for epidemiologic studies. **Am J Epidemiol** 123:918-919, 1986.

15. **Thomas TL**, Fontham ETH, Norman SA, et al. Occupational risk factors for brain tumors: a case-referent death certificate analysis. **Scand J Work Environ Health** 12:121-127, 1986.

16. **Thomas TL**, Stewart PA. Mortality from lung cancer and respiratory disease among pottery workers exposed to silica and talc. **Am J Epidemiol** 125:35-43, 1987.

17. McLaughlin JK, Malker HSR, **Thomas TL**, et al. Brief Report: Occupational risks for meningiomas of the central nervous system in Sweden. **J Occup Med** 29:66-68, 1987.

18. **Thomas TL**, Stolley PD, Stemhagen A, et al. Brain tumor mortality risk among men with electrical and electronics jobs: a case-control study. **J Natl Cancer Inst** 79:233-238, 1987.

19. **Thomas TL**. Mortality among flavor and fragrance chemical plant workers in the United States. **Br J Industr Med** 44:733-737, 1987.

20. Walrath J. Decoufle P, **Thomas TL**. Mortality among workers in a shoe manufacturing company. **Am J Industr Med** 12:615-623, 1987.

21. **Thomas TL**, Stewart PA, Stemhagen A, et al. Risk of astrocytic brain tumors associated with occupational chemical exposures: a case-referent study. **Scand J Work Environ Health** 13:417-423, 1987.

22. Vineis P, **Thomas T**, Hayes RB, et al. Proportion of lung cancers in males, due to occupation, in different areas of the USA. **Int J. Cancer** 42:851-856, 1988.

23. Hayes RB, **Thomas T**, Silverman DT, et al. Lung cancer in motor exhaust-related occupations. **Am J Industr Med** 16:685-695, 1989.

24. Blair A, Steenland K, Shy C, O'Berg M, Halperin W, **Thomas T**. Control of smoking in occupational epidemiologic studies: methods and needs. **Am J Industr Med** 13:3-4, 1988.

25. **Thomas TL**, Kang HK. Mortality and morbidity among Army chemical corps Vietnam veterans: a preliminary report. **Am J Industr Med** 18:665-673, 1990.26.

26. Kang HK, **Thomas TL**. Re: National sources of vital status information: Extent of coverage and possible selectivity in reporting. Letter to the Editor. **Am J Epidemiol** 132:1196-1197, 1990.

27. Watanabe KK, Kang HK, **Thomas TL**. Mortality among Vietnam Veterans: with Methodological Considerations. **J Occup Med** 33:780-785, 1991.

28. Bullman TA, Kang HK, **Thomas TL**. Posttraumatic stress disorder among Vietnam veterans on the Agent Orange Registry: a case-control analysis. **Ann Epidemiol** 1:505-512, 1991.

29. **Thomas TL**, Kang HK, Dalager NA. Mortality among women Vietnam Veterans, 1973-1987. **Am J Epidemiol** 134:973-980, 1991.

30. Heineman EF, Cocco P, Gomez MR, Dosemeci M, Stewart PA, Hayes RB, Zahm SH, **Thomas TL**, Blair A. Occupational exposure to chlorinated aliphatic hydrocarbons and risk of astrocytic brain cancer. **Am J Industr Med** 26:155-169, 1994.

31. Goldman RL, **Thomas TL**. Use of mortality rates as a screening tool: The experience of the Department of Veterans Affairs. **Joint Commission Journal on Quality Improvement** 20:511-522, 1994.

32. **Thomas TL**, Goldsmith R. Department of Energy radiation health studies: Past, present, and future. In: Young JP, Yalow RS (eds). Radiation and Public Perception: Benefits and Risks. Advances in Chemistry Series No. 243, American Chemical Society, Washington, D.C., 1995.

33. Dalager NA, Kang HK, and **Thomas TL**. Cancer mortality among women veterans: The Vietnam experience. **J Occup Med**. (In Press).

BOOKS, CHAPTERS, ARTICLES IN NON-REFEREED PUBLICATIONS

1. **Thomas TL**. Cancer in the petrochemical industry - NCI study of OCAW members. In: Proceedings of a Conference for Workers on Job-Related Cancer. University of Texas, Houston, 1980, pp 99-104.

2. **Thomas TL**, Stewart PA, Blair A. Nonfibrous dust and cancer: studies at the National Cancer Institute. In: Goldsmith DF, Winn DM, and Shy CM (eds). **Silica, Silicosis, and Cancer: Controversy in Occupational Medicine**. Philadelphia, Praeger Press, 1986, pp 441-450.

3. **Thomas, TL, A Retrospective Study of Brain Tumors and Occupational Risk Factors**. Doctoral Dissertation. Johns Hopkins University, Baltimore, MD, May, 1986.

4. Department of Veterans Affairs. **Review of Mortality in VA Medical Centers**. Veterans Health Services and Research Administration, Office of Quality Assurance, Washington, DC, June 1989.

5. WHO, International Agency for Research on Cancer. **IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Occupational Exposures in Petroleum Refining, Crude Oil and Major Petroleum Fuels.** Volume 45. Lyon, France, 1989.

6. **Thomas TL**. Lung cancer mortality among pottery workers in the United States. In Simonato L, Fletcher AC, Saracci R, Thomas TL (eds). Occupational Exposure to Silica and Cancer Risk. IARC Scientific Publications, No. 97. Lyon, France, 1990, pp 75-81.

7. Simonato L, Fletcher AC, Saracci R, **Thomas TL**, eds. **Occupational Exposure to Silica and Cancer Risk**, IARC Scientific Publications, No. 97. Lyon, France, 1990.

8. **Thomas TL.** Primary brain tumors associated with chemical exposures. In: Bleecker ML (ed). **Occupational Neurology and Clinical Neurotoxicology**. Williams and Wilkins, Baltimore, MD, 1994.

PRESENTATIONS: (corresponding publications are noted in parentheses; "N" denotes non-refereed)

CONTRIBUTED:

1. "Mortality among Workers Employed in the Pharmaceutical Industry." 106th Annual Meeting of the American Public Health Association. Los Angeles, CA, October 15-19, 1978 (4).

2. "Mortality among Workers Employed in Petroleum Refining and Petrochemical Plants." 64th Annual Meeting of the American Occupational Medical Association. Anaheim, CA, April 30-May 4, 1979 (5).

3. "A preliminary Investigation of Mortality among Pottery Workers." Thirteenth Annual Meeting of the Society for Epidemiologic Research. Minneapolis, MN, June 18-20, 1980 (10).

4. "Mortality among Corn Wet-Milling Workers." Sixteenth Annual Meeting of the Society for Epidemiologic Research. Winnipeg, Canada, June 15-17, 1983 (12).

5. "Development of Referent Populations for Occupational Studies." Seventeenth Annual Meeting of the Society for Epidemiologic Research. Houston, TX, June 13-15, 1984 (14).

6. "Mortality from Lung Cancer and Respiratory Disease among Pottery Workers exposed to Silica and Talc." Nineteenth Annual Meeting of the Society for Epidemiologic Research. Pittsburgh, PA, June 17-20, 1986 (16).

7. "Brain Tumor Risk in the Electrical and Electronics Industries." Fifth International Symposium on Epidemiology in Occupational Health. Los Angeles, CA, September 9-11, 1986 (18).

8. "Health Status of a Self-Selected Group of 104,000 Vietnam Veterans." Twenty-Second Annual Meeting of the Society for Epidemiologic Research, Birmingham, AL, June 13-16, 1989.

9. "Mortality Study of Army Chemical Corps Vietnam Veterans." Ninth International Symposium on Chlorinated Dioxins and Related Compounds. Toronto, Ontario, Canada, September 17-22, 1989 (25).

10. "Mortality among Women Vietnam Veterans: A Preliminary Analysis." Twenty-Third Annual Meeting of the Society for Epidemiologic Research, Snowbird, UT, June 12-15, 1990 (29).

INVITED:

1. "Results of the ASPO Opinion Survey." Second Annual Meeting of the American Society of Preventive Oncology. Washington, DC, March 9-10. 1978.

2. "Cancer in the Petrochemical Industry: NCI Study of OCAW Members." Conference for Workers on Cancer in the Workplace. National Cancer Institute, Texas AFL-CIO, and University of Houston, Houston, TX, March 30, 1979 (N-1).

3. "Proportionate Mortality Ratio Studies of Refinery and Petrochemical Workers." ORC Occupational Safety and Health Group Meeting. Arlington, VA, November 7-8, 1979.

4. "Studies of Union Members Utilizing Data Collected Routinely for Administrative Purposes." Oil, Chemical, and Atomic Workers International Union, District 8 Meeting. Philadelphia, PA, January 26, 1980.

5. "Brain Cancer among OCAW Members in Three Texas Oil Refineries." Workshop on Brain Tumors in the Chemical Industry. The New York Academy of Sciences, New York, NY, October 27-29, 1980 (7).

6. "Nonfibrous Dust and Cancer: Studies at the National Cancer Institute." Silica, Silicosis and Cancer: An International Symposium. University of North Carolina and the Society for Occupational and Environmental Health, Chapel Hill, NC, April 3-5, 1984 (N-2).

7. "Occupational Risk Factors for Brain Cancer: A Preliminary Report." Clinical Epidemiology Unit Seminar Series. University of Pennsylvania, School of Medicine, Philadelphia, PA, February 20, 1986.

8. "A Comparison of the Standardized Mortality Ratio and Proportionate Mortality Ratio Methodologies." Meeting of the Veterans Administration Advisory Committee on Environmental Hazards. Veterans Administration. Washington, DC, March 4, 1986.

9. "CORPS Project (Computerized Occupational Referent Population System)." Industrial Epidemiologists Semi-Annual Meeting. Pittsburgh, PA, June 17, 1986.

10. "Studies of Silica, Silicosis, and Lung Cancer by the National Cancer Institute of the United States." Working Group on Carcinogenic Risk from Exposure to Silica. International Agency for Research on Cancer, Lyon, France, March 3-4, 1987 (N-6).

12. "Occupational Risk Factors for Brain Tumors." Seminar Series. German Cancer Research Center, Heidelberg, Germany, July 2, 1987.

15. "Agent Orange Registry." Current Issues and Methods in Biostatistics and Epidemiology Course. Georgetown University School of Medicine, Washington, DC, April 27, 1989.

16. "Epidemiologic Studies of Vietnam Veterans by the Department of Veterans Affairs." Clinical Epidemiology Unit Seminar Series. University of Pennsylvania, School of Medicine, October 19, 1989.

17. "VA Studies of Health Effects of the Vietnam Experience." Current Issues and Methods in Biostatistics and Epidemiology Course. Georgetown University School of Medicine, Washington, DC, April 18, 1990.

18. "Exposure to Electromagnetic Fields and Cancer Risk." Current Issues and Methods in Biostatistics and Epidemiology Course. Georgetown University School of Medicine, Washington, DC, April 18, 1991.

19. "Discussion of Epidemiologic Study of Employees Exposed to Downstream Gasoline." International Symposium on the Health Effects of Gasoline, Miami, FL, November 5-8, 1991

20. "Occupational Epidemiology and Studies of Workers Exposed to Ionizing Radiation." President's Special Session on Epidemiology, American Nuclear Society Winter Meeting, November 10-14, 1991.

21. "Department of Energy Radiation Health Studies: Past, Present, and Future." Radiation and Society: A pedagogical symposium. 203rd American Chemical Society National Meeting and Exposition, San Francisco, CA, April 6-8, 1992 (32).

22. "Epidemiologic Studies of Department of Energy Workers." Current Issues and Methods in Biostatistics and Epidemiology Course. Georgetown University School of Medicine, Washington, DC, February, 18, 1993.

Name: **Daniel Allen Hoffman**

DATE/PLACE OF BIRTH: November 28, 1944, Shelby, Ohio

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SOCIAL SECURITY NUMBER: 299-38-9938

EDUCATION:

School	**Degree**
Wittenberg University Springfield, OH	Transferred after Junior Year
University of Missouri Columbia, MO	1967, B.S., Zoology 1969, Master of Science - Public Health
The Johns Hopkins University School of Hygiene and Public Health	1981, Ph.D., Epidemiology

EMPLOYMENT HISTORY:

7/92 - present **Director, Master of Public Health Program,** The George Washington University, School of Medicine and Health Sciences, Washington, DC.

7/92 - present **Associate Professor**, Department of Health Care Sciences, The George Washington University, School of Medicine and Health Sciences, Washington, DC.

10/94-present **Associate Professor**, Department of Medicine, The George Washington University School of Medicine and Health Sciences, Washington, DC.

10/89 - 6/92 **Assistant Director for Science**, National Center for Environmental Health and Injury Control, Centers for Disease Control, Atlanta, GA.

10/86 - 9/89 **Assistant Director for Science**, Division of Environmental Hazards and Health Effects, Center for Environmental Health, Centers for Disease Control, Atlanta, GA.

9/83 - 9/86 **Senior Radiation Epidemiologist**, Radiation Epidemiology Branch, Epidemiology and Biostatistics Program, Division of Cancer Etiology, National Cancer Institute, National Institutes of Health, Bethesda, MD.

10/80 - 8/83	**Radiation Epidemiologist**, Environmental Epidemiology Branch, National Cancer Institute. National Institutes of Health, Bethesda, MD.
6/72 - 9/80	**Epidemiologist**, Epidemiologic Studies Branch, Division of Biological Effects, Bureau of Radiological Health, Food and Drug Administration, Rockville, MD.
7/70 - 5/72	**Epidemiologist**, Office of Radiation Programs, Environmental Protection Agency, Washington, D.C.
6/69 - 6/70	**Radiation Research Scientist**, Center for Radiological Health, Environmental Control Administration, Washington, D.C.
1/68 - 5/69	**Data Processing Specialist**, Missouri Regional Medical Program, University of Missouri. Columbia, MO.
6/67 - 9/67	**COSTEP**, U.S. Public Health Service Commissioned Corps, DHEW, Washington, D.C.
9/66 - 10/67	**Psychiatric Technician**, Missouri Regional Mental Health Center, University of Missouri Medical Center, Columbia, MO.
6/65 - 9/65	**COSTEP**, U.S. Public Health Service Commissioned Corps, Kentucky State Health Department, Frankfort, KY.

CONTINUING EDUCATION:

Applied Regression Analysis
Project Officer's Guide to Government Contracts
Advanced Project Officer's Guide to Government Contracts
Environmental Risk Assessment
Congress and Health Policy Issues-1989
Occupational and Enviromental Health Surveillance
Wordperfect 5.1
DBase III+
The Medical Basis for Radiation Accident Preparedness II
DOS and Advanced DOS for Personal Computers
Statistical Analysis Systems (SAS) Software for Personal Computer
Toxic Wastes and Public Health Policy: The Impact of Superfund
Beginning and Intermediate Japanese
Statistical Methods for Evaluation of Prevention Strategies
Health Effects of Air Pollution: Impact of Clean Air Legislation
Managing Cultural Diversity in Today's Work Force

PROFESSIONAL APPOINTMENTS:

1969-92	Commissioned Officer, United States Public Health Service. Grade at Retirement: Scientist Director (06), Regular Corps
1977-80	Mayo Clinic, Rochester, Minnesota, Department of Medical Statistics and Epidemiology, Special Projects Associate
1981-86	George Washington University School of Medicine, Department of Health Care Sciences, Washington, D.C., Adjunct Assistant Professor
1981-86	Instructor, Foundation for Advanced Education in the Sciences (FAES), Bethesda, Maryland
1981-86	Consultant, Three Mile Island Public Health Advisory Board. Philadelphia, Pennsylvania
1982-86	Member, Scientific Oversight Committee, University of Utah Studies of the Health Effects from Exposure to Fallout Radiation from Nuclear Weapons Testing, National Institutes of Health. Bethesda, Maryland
1983-86	Consultant, National Institutes of Health Committee to Investigate the Effects of 131-I on the Thyroid Gland, Bethesda, Maryland
1983-86	Visiting Scientist, Department of Epidemiology, Radiation Effects Research Foundation, Hiroshima, Japan
1986-92	Member, Public Health Service Group for Input and Communication Regarding Radiation Protection Activities
1988-92	Member, Federal Radiological Preparedness Coordinating Committee
1987	Member, Thyroid Morbidity Subcommittee, Hanford Historical Documents Review Committee, State of Washington
1986-92	Emory University Schools of Medicine/Public Health, Division of Environmental and Occupational Health, Atlanta, Georgia, Visiting Lecturer and Adjunct Associate Professor
1989-90	Public Health Service Work Group to Develop PHS Plan to Reduce Demand for Illicit Drugs
1989-92	Member, Scientist Professional Advisory Committee, U. S. Public Health Service
1989-92	Member, Department of Health and Human Services Emergency Preparedness Group
1989-92	Member, National Emergency Management Team

1989-92	Member, Science Subpanel on Use of BEIR V and UNSCEAR 1988 in Federal Radiation Risk Assessment Policies, Federal Committee on Interagency Radiation Research and Policy Coordination
1989-present	Chairman, Peer Review Group, State of Arizona Study of Childhood Leukemia Incidence, Phoenix, Arizona
1990-92	Chairman, Peer Review Group, State of Massachusetts Case- Control Study of Leukemia around the Pilgrim Nuclear Reactor, Massachusetts
1990-91	Chairman, Risk Working Group, Ad Hoc Subcommittee on the Risks and Benefits of Water Fluoridation, Committee to Coordinate Environmental and Health Related Policy, U. S. Department of Health and Human Services
1990	Chairman and Organizer, National Conference Addressing the Issues Associated with the Use of Potassium Iodide as a Radioprotective Agent
1990-92	Member, Information Systems Working Group, Comprehensive Epidemiologic Data Resource (CEDR), Lawrence Berkely National Laboratory, University of California
1990-92	Member, Environmental and Occupational Health Academic Advisory Council, Emory University School of Public Health
1991-92	Member, Public Health Service Task Force on Improving Medical Criteria for Disability Determination
1991-92	Member, State Department Chernobyl Information Coordination Group
1991-93	Member, Southeastern Massachusetts Health Study Review Panel, Study of Health Effects from Pilgrim Nuclear Reactor
1992-94	Technical Advisor, The Center to Protect Workers' Rights, Washington, DC
1992	Technical Consultant, Subcommittee on Risk Assessment of Ingested Fluoride, Committee on Toxicology, Board on Environmental Studies and Toxicology, Commission on Life Sciences, National Academy of Sciences
1992	Member, Special Review Committee, Review of Proposals for Development of a Model System for Identifying Neonatal Hearing Impairment, National Institute on Deafness and Other Communication Disorders, National Institutes of Health
1993	Member, Special Review Committee, Review of Grant Applications for Centers for Disease Control and Prevention's Public Health Training Network, Association of Teachers of Preventive Medicine/Association of Schools of Public Health
1993	Member, Environmental Health Task Force, District of Columbia Commission on Public Health, Department of Human Services

1993-present	Member, District of Columbia Commission on Public Health Advisory Board
1993	Member, Site Visit Team, Evaluation of Proposed MD/MPH Program at SUNY Health Science Center, Syracuse, New York
1994	Member, Steering Committee, Centers for Disease Control and Prevention/Association of Teachers of Preventive Medicine/Association of Schools of Public Health, Grants Program for Preventive Medicine and Public Health Students
1994	Chairman, Peer Review Committee to review proposals for a study of the risk of ovarian cancer among women receiving fertility drugs. National Institute of Child Health and Human Development, National Institutes of Health
1994	Member, Peer Review Committee, International Study of Nuclear Workers, Office of Health, Environment and Safety, Department of Energy
1994	Member, Institutional Review Board, National Cancer Institute Study of Prostate and Lung Cancer
1994	Co-chair, Environmental Health Work Group, District of Columbia Commission of Public Health, Second Annual Health Care Reform Conference, Howard University, May 5, 1994.
1994	Chair, Study Section, National Institutes of Health, National Institute of Environmental Health Sciences, Grant Reviews for Superfund Research and Educational Projects
1995	Principal Investigator, Long-term collaborative project for studies of carcinogenic risks associated with low-dose rate radiation in populations living in the vicinity of the Mayak Industrial Association, Chelyabinsk Oblast, Russian Federation. United States-Russian Federation Joint Coordinating Committee for Radiation Effects Research.

MEDICAL CENTER COMMITTEES:

1992-present	Chairman, Admissions Committee, Master of Public Health Program
1992-present	Member, Committee on Health Sciences Graduate Student Evaluation, School of Medicine and Health Sciences
1992-present	Member, Committee on Health Sciences Programs, School of Medicine and Health Sciences
1993-present	Member, Cancer Control Committee, Cancer Center, George Washington University Medical Center

UNIVERSITY COMMITTEES:

1994-present	Member, Green University Task Force, George Washington University
1994-present	Member, Faculty Senate Committee on Admissions Policy, Student Financial Aid, and Enrollment Management
1994-present	Member, Joint Committee of Faculty and Students

CENTERS FOR DISEASE CONTROL PROFESSIONAL ACTIVITIES:

1990-92	Chairman, Charles C. Shephard Science Award Executive Committee
1989-92	Member, Excellence in Science Committee
1989-92	Member, Epidemiology Advisory Committee
1989-92	Member, Preventive Medicine Residency Advisory Committee
1989-92	Member, Honor Awards Policy Board
1989-92	Member, Long-term Training Advisory Committee
1989-92	CDC Liaison to the National Advisory Environmental Health Science Council
1987	Member, Scientific Program Planning Committee, Epidemiologic Intelligence Service Annual Conference
1989	Member, Scientific Program and Planning Committee, Fourth National Environmental Health Conference
1989-90	Member, International Health Working Group
1989-90	Member, Research Officer Group Implementation Committee
1989-90	Member, Year 2000 Health Objectives for the Nation Task Force: Environmental Health Objectives Workgroup
1990	Member, Filovirus Task Force
1990-91	Member, Planning Committee for International Workshop on the Health Effects of Electromagnetic Radiation (also served on expert panel on epidemiologic issues in occupational exposures to electromagnetic fields)
1990	Member, Planning Committee for the Surgeon General's Conference on Rural Safety and Health

1990-92	Chairman, Secondary Review Committee for Injury and Injury Prevention Research Center Grant Awards
1990-91	Member, Scientific Program Planning Committee, U. S. Public Health Service Professionals Annual Meeting
1991-92	Member, CDC/DOE Task Force to Implement Transfer of Department of Energy Radiation Epidemiology Program to CDC
1991-92	Member, CDC Committee on Prevention Effectiveness
1991	Participant and Group Leader, Centers for Disease Control Epidemiologic and Statistical Methods Retreat, September 23-24, 1991, Unicoi State Park

PROFESSIONAL SOCIETIES:

Year Joined	Organization
1973	American Public Health Association, Epidemiology Section
1975	Society for Epidemiologic Research
1975	American Association for the Advancement of Science
1976	Commissioned Officers Association of the USPHS
1979	International Epidemiological Association
1979	New York Academy of Sciences
1983	Fellow, American College of Epidemiology Chair, 1993 Annual Meeting Program Committee Member, Education Committee (1992-present)
1986	Hazardous Materials Control Research Institute
1988	International Society for Environmental Epidemiology
1988	Society for Occupational and Environmental Health
1992	International Society of Exposure Analysis
1992	Association of Teachers of Preventive Medicine Member, Council of Graduate Programs in Preventive Medicine (1992-present) Member, Research Committee (1992-present) Reviewer, ATPM/CDC Minority Internship Program Member, Steering Committee, CDC/ATPM Small Grants
1993	Delta Omega, Alpha Chapter

HONORS:

1976-77	Public Health Service Fellowship Award
1980	United States Public Health Service Certificate of Appreciation for Outstanding Contributions During the Federal Response to the Accident at Three Mile Island
1983	Elected as a Fellow, American College of Epidemiology
1987	Russell Hibbs Clinical Award Finalist, Scoliosis Research Society, For the Outstanding Scientific Paper of the Year
1988	United States Public Health Service Outstanding Service Medal for Outstanding Contributions to the Field of Radiation Epidemiology
1988	Burr H. Curtis, M.D. Pioneer Award, Pediatric Orthopaedic Society of North America, For the Outstanding Scientific Paper of the Year
1989	United States Public Health Service Unit Commendation for Developing and Implementing a Comprehensive Survey of Radon Levels in National Park Service Housing
1989	United States Public Health Service Citation for Outstanding Technical Expertise in Coordinating the Public Health Service's Response to Cosmos 1900
1990	Department of Health and Human Services Certificate of Appreciation for Outstanding Contributions to the Federal Response in the Aftermath of Hurricane Hugo-1989
1991	United States Public Health Service Commendation Medal for Initiating and Successfully Completing a Key Epidemiologic Study of Radiation-Induced Breast Cancer
1991	United States Public Health Service Unit Commendation Award for Outstanding Contributions to the Year 2000 Health Objectives for the United States
1991	Joint Federal Emergency Management Agency/Department of Health and Human Services Certificate of Appreciation for Outstanding Contributions as a Member of the National Emergency Management Team
1991	United States Public Health Service Special Assignment Award
1991, 1992	Emory University Certificate of Appreciation In Recognition of Devoted Service in Teaching the Theory and Practice of Public Health
1992	United States Public Health Service Outstanding Unit Citation for the Development of the PHS Report on Fluoride Risks and Benefits

1992	United States Public Health Service Meritorious Service Medal for an Outstanding Career and Contributions to the Field of Environmental Health
1993	Elected to Delta Omega (Alpha Chapter), National Public Health Honorary Society

AD HOC REVIEWER FOR THE FOLLOWING JOURNALS:

Journal of the American Medical Association
Journal of the National Cancer Institute
New England Journal of Medicine
Journal of Clinical Epidemiology
American Journal of Epidemiology
Americal Journal of Public Health
Science
Cancer
Cancer Research
Preventive Medicine
Health Physics
Archives of Environmental Health

TEACHING EXPERIENCE

1976-77	Teaching Assistant, The Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland
1981-86	Instructor, Foundation for Education in the Sciences (FAES) Bethesda, Maryland
1981-86	Adjunct Assistant Professor, George Washington University School of Medicine and Health Sciences, Department of Health Care Sciences, Washington, D.C.
1986-92	Visiting Lecturer and Adjunct Associate Professor, Emory University Schools of Medicine and Public Health, Departments of Community Medicine and Environmental and Occupational Health, Atlanta, Georgia
1992-present	Associate Professor, Department of Health Care Sciences, The George Washington University School of Medicine and Health Sciences, and Director of the Master of Public Health Program.

GRANT SUPPORT:

U. S. Department of Health and Human Services, U. S. Public Health Service, Health Resources and Services Administration Grant for Public Health Traineeships. **Principal Investigator.** August 15, 1993 through June 30, 1994.

U. S. Department of Health and Human Services, U. S. Public Health Service, Health Resources and Services Administration Grant for Public Health Traineeships. **Principal Investigator.** July 1, 1994 through June 30, 1995.

U. S. Department of Health and Human Services, U. S. Public Health Service, Health Resources and Services Administration Grant for Public Health Traineeships. **Principal Investigator.** July 1, 1995 through June 30, 1996.

CURRENT RESEARCH PROJECTS:

Study of blood lead levels in workers engaged in renovation work. Supported by the Environmental Protection Agency.

Smoking-attributed mortality: a review of the Centers for Disease Control and Prevention's estimates of the health burden of tobacco use. Sponsored by the Office of Smoking and Health, Centers for Disease Control and Prevention.

Establishing a scientific research registry of persons in Ukraine exposed to radiation from the 1986 Chernobyl nuclear power plant explosion. Sponsored by the United States Department of Energy.

Long-term study of health effects from low-dose rate radiation exposure in the Russian Federation, Chelyabinsk Oblast, Mayak Industrial Association.

BIBLIOGRAPHY:

1. Tompkins EA, Hoffman DA, Hamilton PM. Infant mortality around three nuclear reactors. In: LeCam LM, Neyman J, Scott EL (Eds). Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability. Vol. 6. Effects of Pollution on Health. Los Angeles, Univ. of California, 1972, pp. 279-290.

2. Hoffman DA. Use and misuse of vital statistics. DHEW Publication No. (FDA) 72-8041, Washington, DC, 1972, 12 pp.

3. Silverman CS, Hoffman DA. Tumor risk from head and neck radiation. In: Hart JC, Ritchie RH, Varnadorne BS (Eds). Proceedings of the Eighth Mid-Year Topical Symposium of the Health Physics Society. Washington, DC, U.S. Dept. of Energy (CONF-741018), 1974, pp. 121-8.

4. Silverman CS, Hoffman DA. Thyroid tumor risk from radiation during childhood. Pediat Digest 10:33, 1976.

5. Silverman CS, Hoffman DA. Thyroid tumor risk from radiation during childhood. Prev Med 4:100-107, 1975.

6. Hoffman DA. Mortality in patients treated for hyperthyroidism. Radiat Res (Supplement) 1:45, 1976.

7. Hoffman DA, Lundin FE Jr. Does 131-I therapy for Graves' disease cause cancer? New Eng J Med 299:622, 1978.

8. Hoffman DA, McConahey WM, Diamond EL, et al. Mortality in women treated for hyperthyroidism. Am J Epidemiol 112:437-8, 1980.

9. Hoffman DA. Follow-up study of women treated for hyperthyroidism. In: Proceedings of Bureau of Radiological Health Symposium on Biological Effects, Imaging Techniques, and Dosimetry of Ionizing Radiations. DHHS Publications (FDA) 80-8126, Washington, DC, U.S. Government Printing Office, 1980, pp. 25-35.

10. Hoffman DA, Harlow CW. Effects of fallout radiation on the thyroid glands of children in the southwestern United States. In: Proceedings of Bureau of Radiological Health Symposium of Biological Effects, Imaging Techniques, and Dosimetry of Ionizing Radiations. DHHS Publications (FDA) 80-8126, Washington, DC, U.S. Printing Office, 1980, pp. 73-84.

11. Hoffman DA, Felten RP, Cyr HW. Effects of Ionizing Radiation on the Developing Embryo and Fetus: A Review. DHHS Publication (FDA) 81-8170, 1981, 149 pp.

12. Hoffman DA. Mortality in women treated for hyperthyroidism. Ph.D. Thesis, The Johns Hopkins University School of Hygiene and Public Health, 1981, 720 pp.

13. Hoffman DA, Harlow CW, Tully MJ. A feasibility study of the biological effects of fallout on people in Utah, Nevada, and Arizona. DHHS Publication (FDA) 81-8151, 1981, 12 pp.

14. Hoffman DA, McConahey WM. Thyroid disease and breast cancer. Lancet 1:730, 1981.

15. Hoffman DA. Breast cancer in women treated for thyroid disease. Am J Epidemiol 114:422, 1981.

16. Hoffman DA, McConahey WM, Diamond EL, et al. Mortality in women treated for hyperthyroidism. Am J Epidemiol 115:243-254, 1982.

17. Hoffman DA, McConahey WM, Fraumeni JF Jr, et al. Cancer incidence following treatment for hyperthyroidism. Internat J Epidemiol 11:218-224, 1982.

18. Hoffman DA, McConahey WM. Thyrotoxicosis and asthma. Lancet 1:808, 1982.

19. Hoffman DA. Late effects of radiotherapy. In: Proceedings of the Ninth Annual Meeting of the Society of Nuclear Medicine. Baltimore, MD, January 22, 1982.

20. Hoffman DA. Late effects of 131-I therapy: The U.S. experience. In: Boice JD Jr, Fraumeni JF Jr. (Eds). Radiation Carcinogenesis: Epidemiology and Biological Significance. New York, Raven Press, pp. 273-280, 1984.

21. Hoffman DA, McConahey WM, Diamond EL. Breast cancer following 131-I therapy for hyperthyroidism. J Nat Cancer Inst 70:63-7, 1983.

22. Harris P, Hoffman DA, Lessin L. Multiple myeloma in runners. In: Proceedings of the American Society of Clinical Oncology, p. 8, 1983.

23. Hoffman DA, McConahey WM. Breast cancer following 131-I therapy for hyperthyroidism. Ob/Gyn Digest 12:15, 1983.

24. Biggar RJ, Curtis RE, Hoffman DA, et al. Second primary cancers following salivary gland malignancies. Br J Cancer 47:383-6, 1983.

25. Hoffman DA. Re: Mortality in women treated for hyperthyroidism. The first author replies. Am J Epidemiol 116:872-3, 1982.

26. Hoffman DA, McConahey WM, Brinton LA, et al. Breast cancer in hypothyroid women using thyroid supplements. J Am Med Assoc 251:616-9, 1984.

27. Ron E, Curtis R, Hoffman DA, et al. Multiple primary breast and thyroid cancer. Br J Cancer 49:87-92, 1984.

28. Brinton LA, Hoffman DA, Hoover R, et al. Relationship of thyroid disease and use of thyroid supplements to breast cancer risk. J Chronic Dis 37:877-883, 1984.

29. Brinton LA, Hoffman DA, Hoover R, et al. Variance and dissent. J Chronic Dis 37:891-3, 1984.

30. Ishimaru T, Land CE, Ershow A, Hoffman DA, et al. Risk factors of thyroid cancer among A-bomb survivors and controls, Hiroshima and Nagasaki. RERF Technical Report, 1985.

31. Hoffman DA, Radford EP. A review of the effects of low doses of ionizing radiation. Three Mile Island Publications, Philadelphia, PA, 180 pp., 1985.

32. Tucker M, Boice JD Jr, Hoffman DA. Second cancer following cutaneous melanoma and cancers of the brain, thyroid, connective tissue, bone, and eye in Connecticut, 1935-1982. Natl Cancer Ist Monogr 68:161-190, 1985.

33. Ishimaru T, Hoffman DA, Land CE, et al. Epidemiologic study of thyroid cancer in life span study sample, 1958-1979. RERF Research Protocol, RP 12-85, June 1986.

34. Hoffman DA, Morin M, Lonstein J, et al. Breast cancer risk in scoliotic women exposed to multiple diagnostic x-rays. Am J Epidemiol 126:764, 1987.

35. Hoffman DA. Radon in the environment. Public health implications. In: Proceedings of Conference on Radiation Safety and Protection, Han P, Ed. pp 55-70, 1987.

36. Hoffman DA. Risk of breast cancer in women exposed to multiple diagnostic x-rays. In: Proceedings of the Seventh Annual Congress of the International Radiation Protection Association, 1988.

37. Visscher W, Lonstein JE, Hoffman DA, et al. Reproductive outcome in scoliosis patients. Spine 13:1096-1098, 1988.

38. Visscher W, Hoffman DA, Lonstein JE, et al. The effect of medical x-ray exposure on subsequent reproductive outcomes in scoliosis patients. Am J Epidemiol 128:884, 1988.

39. Hoffman DA, Lonstein JE, Morin M, et al. Breast cancer in women with scoliosis exposed to multiple diagnostic x-rays. J Natl Can Inst 81:1307-1312, 1989.

40. Eheman C, Kotlovker D, Hoffman DA. Results from the National Park Service indoor radon sampling program. IN: Proceedings of the 1988 Symposium on Radon and Radon Reduction Techniques, Volume II. Environmental Protection Agency, National Technical Information Service. Springfield, VA. pp 344-352, 1988.

41. Hoffman DA. Biologic effects of infrared radiation. J Am Med Asso 120:703, 1988.

42. Hoffman DA. The role of epidemiology in assessing risks from exposures to toxic chemicals. IN: Risks from use of Agricultural Chemicals, Bucholz D, Ed. University of Missouri Press, Columbia, MO., 1988, pp. 15-22.

43. Houk VN, Hoffman DA, Eheman CE. Public health implications of radon exposures in the United States. IN: Environmental Radon: Occurrence, Control and Health Hazards. Majumdar SK, Schmalz RF, Miller EW, Eds. The Pennsylvania Academy of Science Publication, Easton, PA. pp 216-222, 1990.

44. Thacker SB, Hoffman DA, Smith J, et al. The effect of low-level body burdens of lead on children's IQ: The limitations of meta-analysis in a review of longitudinal data. Arch Env Health 47:336-346, 1992.

45. Ad hoc subcommittee on benefits and risks of fluoride, Committee to Coordinate Environmental Health and Related Programs, Department of Health and Human Services. The Benefits and Risks of Water Fluoridation, (DHHS Report, February, 1991).

46. Committee on Interagency Radiation Research and Policy Coordination (CIRRPC), Science Sub-panel. Use of BEIR V and UNSCEAR 88 in Radiation Risk Assessment Policy. (CIRRPC Science Panel Report No. 9, ORAU 92/F-64, Office of Science and Technology Policy, Executive Office of the President, December 1992).

47. Andrews JA, Jr., Askew LO, Bucsela JA, Hoffman DA, Johnson BL, and Xintaras C, Eds.: Environmental Issues: Today's Challenge for the Future. Proceedings of the Fourth National Environmental Health Conference, November, 1990, 326 pps., DHHS Publication, Washington, DC.

48. Hoffman DA. Fluoride: Its Risks and Benefits. Health and Environ Digest 5:1-4, 1991.

49. Public Health Service Report on Fluoride Benefits and Risks. J Am Med Assoc 266:1061-1067, 1991.

50. Hoffman DA, Furman LJ. Centers for Disease Control. Public Health Service Report on Fluoride Benefits and Risks. MMWR 1991;40(No. RR-7), 1-8.

51. **Health Effects of Ingested Fluoride.** Contributing Author, Chapter 5, pp. 85-90. National Academy Press, Washington, DC, 1993, 181 pp.

52. Hoffman DA, Thacker SB. The effects of electrical and magnetic fields on pregnancy. Birth (in press).

53. Eheman D, Carson R, Hoffman DA. The distribution of radon exposures among National Park Service cave employees. Health Phys (in press).

54. Eheman C, Swygert L, Hoffman DA. Survey of residents in Dekalb County, Georgia, to determine levels of knowledge and level of concern about indoor radon. Health Physics (in press).

55. Hoffman DA, Sever LE. Occupational exposures to ionizing and non-ionizing radiation: A review of the evidence for health effects. Epidemiol Rev (in press).

56. Visscher W, Mandel JS, Connett JE, Hoffman DA, et al.: Preconception X-ray exposure and preterm and low birthweight births in scoliosis patients. Epidemiology (in press).

57. Chen D, Roman GC, Hoffman DA, et al.: Epidemiologic study of self-reported sleep disturbances in the U. S. population: Results of the National Health and Nutrition Examination Study. Neuroepidemiology (in press, 1993)

SELECTED PRESENTATIONS:

Infant mortality around three nuclear reactors. June 20, 1971. 6th Berkeley Symposium on Mathematical Statistics and Probability. Berkeley, CA.

Thyroid tumor risk from radiation during childhood. October 22, 1974. Health Physics Society 8th Mid-year Topical Symposium. Knoxville, TN.

Thyroid nodularity in Southwestern United States schoolchildren exposed to fallout radioiodine. November 8, 1973. 101st Annual Meeting of the American Public Health Association. San Francisco, CA.

Delayed effects of therapeutic levels of 131-I: Mortality in patients treated for hyperthyroidism. June 29, 1976. 24th Annual Meeting of the Radiation Research Society. San Francisco, CA.

Effects from exposure to diagnostic 131-I. January 15, 1976. Department of Epidemiology Seminar Series, The Johns Hopkins University School of Hygiene and Public Health. Baltimore, MD.

Mortality among patients treated for hyperthyroidism. March 28, 1978. 13th Annual Meeting of the USPHS. Professional Association. Atlanta, GA.

Health effects from environmental radiation. October 2, 1978. Environmental Health and Epidemiology: Joint Departmental Seminar Series on Current Issues in Environmental Health. The Johns Hopkins University School of Hygiene and Public Health. Baltimore, MD.

Methodologic issues and cohort studies. December 12, 1978. Mayo Clinic, Department of Medical Statistics and Epidemiology Seminar. Rochester, MN.

A morbidity and mortality follow-up study of women treated for hyperthyroidism. June 6, 1979. Bureau of Radiological Health Symposium on Biological Effects, Imaging Techniques, and Dosimetry of Ionizing Radiation. Rockville, MD.

Thyroid nodularity in schoolchildren exposed to fallout radioiodine. June 6, 1979. Bureau of Radiological Health Symposium on Biological Effects, Imaging Techniques, and Dosimetry of Ionizing Radiation. Rockville, MD.

Morbidity and mortality in women treated for hyperthyroidism. April 22, 1980. Bureau of Radiological Health Seminar Series. Rockville, MD.

Mortality in women treated for hyperthyroidism. June 19, 1980. 13th Annual Meeting of the Society for Epidemiologic Research. Minneapolis, MN.

Epidemiologic studies of current interest in nuclear medicine. September 4, 1980. Veterans Administration Conference on Health Physics in the Practice of Clinical Nuclear Medicine. Washington, DC.

Interpretation of epidemiologic studies for the practicing clinician. May 2, 1981. George Washington University School of Medicine and Health Sciences. Washington, DC.

Risk of breast cancer in women treated for thyroid disease. June 18, 1981. 14th Annual Meeting of the Society for Epidemiologic Research. Snowbird, UT.

Research on the health effects of radioiodine. September 9. 1981. 59th Annual Meeting of the Interagency Collaborative Group on Environmental Carcinogenesis. Bethesda, MD.

Cancer incidence following treatment of thyrotoxicosis. August 25, 1981. 9th Scientific Meeting of the International Epidemiologic Association. Edinburgh, Scotland.

Late effects of radiotherapy. January 22, 1982. 9th Annual Meeting of the Society for Nuclear Medicine. Baltimore, MD.

Clinical trials of Hepatitis-B vaccine. February 11, 1982. George Washington University School of Medicine and Health Sciences. Washington, DC.

Recent events in cancer epidemiology. May 12, 1982. National Press Club Scientific Seminar Series. Washington, DC.

Radioactive iodine therapy (U.S.A.). May 25. 1982. Radiation Carcinogenesis: Epidemiology and Biological Signinficance. Bethesda, MD.

Public health aspects of chronic disease. October 5, 1982. Montgomery County Health Department Workshop on Chronic Diseases. Rockville, MD.

Risk of cancer in patients treated for hyperthyroidism. October 22, 1982. University of Maryland School of Medicine, Department of Epidemiology and Preventative Medicine Seminar. Baltimore, MD.

Risk factors for atrial fibrillation. April 21, 1983. George Washington University School of Medicine and Health Sciences. Washington, DC.

Epidemiology of Radiation Carcinogenesis. October 12, 1983. Center for Adult Diseases, Department of Field Research Seminar. Osaka, Japan.

Current topics in cancer epidemiology. November 21, 1983. Montgomery County Health Department Workshop on Chronic Disease. Rockville, MD.

Bioeffects of ionizing radiation: Human epidemiology. February 28, 1984. National Institutes of Health, Radiation Safety Course Lecture. Bethesda, MD.

Cancer risk in persons treated for scoliosis. April 30, 1984. Medical Radiation Advisory Committee, National Center for Devices and Radiological Health. Rockville, MD.

Use of clinical trials in epidemiologic research. April 26, 1984. George Washington University School of Medicine and Health Sciences. Washington, DC.

Overview of the health effects of ionizing radiation. April 4, 1985. Pennsylvania State University Public Information Series on Three Mile Island. Middletown, PA.

Biological effects of radiation: Recent findings. October 12, 1985. Symposium on Radiation and Public Health in New England, Harvard School of Public Health. Boston, MA.

Health consequences of radiation exposure. August 7, 1986. Uniformed Services University of the Health Sciences Epidemiology Conference. Bethesda, MD.

Health effects of environmental radiation. January 27, 1987. Emory University School of Medicine. Atlanta, GA.

Breast cancer risk in scoliotic women exposed to multiple diagnostic x-rays. June 18, 1987. 20th Annual Meeting of the Society for Epidemiologic Research. Amherst, MA.

Radon in the environment - Public health implications. September 10, 1987. Conference on Radiation Safety and Protection, Atlanta University Center. Atlanta, GA.

Breast cancer risk in scoliotic women exposed to multiple diagnostic x-rays. September 16, 1987. 22nd Annual Meeting of the Scoliosis Research Society. Vancouver. British Columbia, Canada.

Reproductive outcome in scoliosis patients. September 16, 1987. 22nd Annual Meeting of the Scoliosis Research Society. Vancouver, British Columbia, Canada.

Cancer risks from environmental exposures. February 21, 1988. Interdisciplinary course in cancer control, Emory University School of Medicine. Atlanta, GA.

Biological effects of exposure to ionizing radiation. March 7, 1988. Emory University School of Medicine, Atlanta, GA

Breast cancer risk in scoliotic women exposed to multiple diagnostic x-rays. April 14, 1988. 7th Annual Congress of the International Radiation Protection Association. Sydney, Australia.

Breast cancer risk in scoliotic women. May 5, 1988. Annual Meeting of the Pediatric Orthopedic Society of North America. Denver, CO.

The effect of medical x-ray exposures on subsequent reproductive outcomes in scoliosis patients. June 15, 1988. 21st Annual Meeting of the Society for Epidemiologic Research. Vancouver, British Columbia, Canada.

The role of epidemiology in assessing risks from exposures to toxic chemicals. November 21, 1988. Argicultural Short Course, University of Missouri, Columbia, MO.

Public health implications of radon exposure. January 28, 1989. 22nd Annual Meeting of the Georgia Conservancy. Pine Mountain, GA.

The role of epidemiology in developing useful data for public health policy. June 8, 1989. Workshop on Estimating and Valuing Morbidity in a Policy Context. Keynote Speech for Association of Environmental and Resource Economists. Research Triangle Park, NC.

Health and science policy issues associated with exposures to radon. Chairman and discussant for plenary session, Fourth National Environmental Health Conference. June 19, 1989. San Antonio, Texas.

Cancer risks and diagnostic radiography. July 11, 1989. International Conference on Radiation and Cancer Epidemiology, Birmingham, United Kingdom (also chaired a session at this conference).

Disease surveillance and health effects studies of populations exposed to radiation emissions from the Hanford Nuclear Weapons Facility. October 11, 1989. Annual Meeting of Physicians for Social Responsibility, Portland Chapter. Portland, Oregon.

Biological effects of exposure to ionizing radiation: A review of the epidemiological evidence. October 12, 1989. Oregon State University Radiation Center Seminar. Corvallis, Oregon.

Invited discussant for plenary session paper entitled " Childhood cancer near Three Mile Island: nuclear plant emissions and background radiation." June 15, 1990. 23rd Annual Meeting of the Society for Epidemiologic Research, Snowbird, Utah.

Scientific Workshop of the Health Effects of Electromagnetic Radiation on Workers. January 30-31, 1991. Sponsored by the National Institute for Occupational Safety and Health, Cincinnati, Ohio.

Scientific Workshop on Future Epidemiologic Studies of Health Effects of Electromagnetic Frequency Radiation. February 6-8. Sponsored by the Electrical Power Research Institute, Carmel, California.

Environmental Health Opportunities and Activities at the Centers for Disease Control. March 25, 1991. Invited Panel Member and Discussant for Emory University Assembly V, Emory and the Environment. Atlanta, Georgia.

Environmental Health in the 21st Century: Priorities for the Future. April 15, 1991. Invited speech before the Annual Meeting of the American Chemical Society, Atlanta, Georgia.

Emergency Preparation: Activities and Capabilities of the Center for Environmental Health. April 22, 1991. Presentation before Members of the North Atlantic Treaty Organization Committee on the Challenges of Modern Society, Atlanta, Georgia.

Workshop on Evaluation Occupational/Environmental Outreach Programs. May 23-24, 1991. Sponsored by the Institute of Medicine, National Academy of Sciences, Washington, D.C.

The role of epidemiology in environmental health studies. May 28, 1991. International Symposium on Environmental Mutagenesis and Carcinogenesis, Shanghai, Peoples Republic of China.

Three Mile Island Population Registry-Based Cohort Cancer Incidence: July 1982-June 1989. June 13, 1991. 24th Annual Meeting of the Society for Epidemiologic Research, Buffalo, New York.

Exposure assessment in environmental epidemiology studies: dioxin as a paradigm for biomarker validation. July 11, 1991. Invited speech before the International Conference on The Epidemiology of Alzheimer's Disease: the Search for Environmental Risk Factors. Bethesda, Md.

Recent recommendations for fluoride uses: A forum on issues in implementation. October 2, 1991. Invited speech before the 54th Annual Meeting of the American Association of Public Health Dentistry, Bellevue, Washington.

Health effects of fluoride. Invited presentation before the National Research Council Board on Environmental Studies and Toxicology, Committee on Toxicology. November 14, 1991. Irvine, Ca

A review of the effects of fetal exposure to ionizing radiation. July 12, 1993. Invited presentation. Plenary Session on Fetal Exposure at the 38th Annual Meeting of the Health Physics Society, Atlanta, Ga.

Occupational exposure to machining fluids and risk of cancer. May 18, 1995. Invited presentation. Annual meeting of American Society for Testing and Materials, Chicago, Il.

Health effects of x-rays in patients with scoliosis. Invited presentation. July 28, 1995. Special symposium on "Biological Response to Medical Radiations in Therapy and Diagnosis." Annual meeting of the American College of Radiology, Boston, Ma.

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Born:	October 14, 1952, Ft. Knox, KY

ACADEMIC EXPERIENCE:

1970	Oak Ridge High School, Oak Ridge, TN
1970	Summer School; Virginia Polytechnic Institute and State University, Blacksburg, VA
1974	B.A., Biological Sciences, Indiana University, Bloomington, IN
1978	M.S., Human Genetics, Medical College of Virginia, Virginia Commonwealth University, Richmond, VA
1979	Summer School; 14th Graduate Session in Epidemiology, University of Minnesota, Minneapolis, MN
1984	Ph.D., Environmental Epidemiology, Department of Epidemiology, School of Public Health, University of North Carolina, Chapel Hill, NC

JOB EXPERIENCE:

March 1991-Present:
Director of the Center for Epidemiologic Research, and Epidemiology Research Section Leader, Oak Ridge Associated Universities, Oak Ridge, TN

January 1986-February 1991:
Deputy Director of the Center for Epidemiologic Research, and Epidemiology Research Section Leader, Oak Ridge Associated Universities, Oak Ridge, TN

January 1983-December 1985:
Epidemiology Research Section Leader, Oak Ridge Associated Universities, Center for Epidemiologic Research, Oak Ridge, TN

August 1981-December 1982:
Epidemiologist, Oak Ridge Associated Universities, Center for Epidemiologic Research, Oak Ridge, TN

August 1979-June 1980:
Teaching assistant, Department of Epidemiology, University of North Carolina, Chapel Hill, NC

September 1977-August 1981 (part time-20 hrs/wk):
Medical laboratory technologist, Blood Bank, North Carolina Memorial Hospital, Chapel Hill, NC

October 1976-August 1977:
Laboratory Specialist in genotyping laboratory, Department of Human Genetics, Medical College of Virginia, Richmond, VA

January 1975-October 1976 (part time-20 to 30 hrs/wk):
Laboratory specialist, Department of Clinical Pathology, Chemistry Division, Medical College of Virginia, Richmond, VA

January 1974-August 1974 (part time-30 hrs/wk):
Laboratory assistant to Dr. Howard Gest, Department of Microbiology, Indiana University, Bloomington, IN

COMMITTEES AND SPECIAL ACTIVITIES:

August 1981-December 1992:

Member of the Oak Ridge Associated Universities/University of North Carolina Research Planning Group to plan and approve ongoing and new projects in the Health and Mortality Study of Department of Energy Workers.

January 1983-December 1986:

Consultant to the Coal Employment Project, Oak Ridge, TN, in a study of reproductive outcomes in female coal miners.

1982, 1983, 1984:

Recipient of Department of Health and Human Services/Public Health Service Minority High School Student Research Apprentice Program Grant to expose minority high school students to health research through supervision of summer research projects.

1984-1985:

Member of a panel to produce document, "A Panel's Review and Findings of Ongoing Health Effects and Epidemiological Studies of Operations at the Savannah River Plant, Aiken, SC."

1985-1990:

Member of an international scientific steering committee (Chairman, Sir Richard Doll, UK) to determine whether exposure to specific forms of nickel significantly increases the risk of developing cancer. Sponsored by the U.S. Environmental Protection Agency and various European Agencies.

May 6-7, 1987:

Faculty member for a course entitled "Basic Concepts of Radiation for Attorneys," taught to the Department of Justice Radiation Defense Attorneys. Washington, D.C.

June 11-18, 1987:

Faculty member for the Taiwan Power Company sponsored seminar "Conference on Risk Assessment, Preventive Analysis and Emergency Preparedness." Taipei, Taiwan.

June 29-July 1, 1987, and January 6-8, 1993:

Faculty member for a course entitled "Basic Concepts of Radiation for Attorneys," taught at the Radiation Emergency Assistance Center/Training Site of Oak Ridge Associated Universities. Oak Ridge, Tennessee.

January 1995 - present:

Member of a Project Research Team (PRT) for the U.S. Department of Energy's Office of International Health Studies. The PRT is working with researchers in Chelyabinsk, Russia on studies of the health effects of working at and living in the vicinity of the Mayak plutonium processing facility in that region.

PUBLICATIONS:

Cragle DL, JI Townsend, MJV Smith, and WE Nance. 1977. A method for weighting to estimate gene frequencies in inbred populations. Virginia Journal of Science 28:101 (Abstract).

Cragle DL, DR Hollis, CM Shy, and TH Newport. 1984. A retrospective cohort mortality study among workers occupationally exposed to metallic nickel power at the Oak Ridge Gaseous Diffusion Plant. In Symposium on Nickel in the Human Environment, International Agency for Research on Cancer, Lyon, France. IARC Publications No. 53, pp 57-64.

Cragle DL, DR Hollis, JR Qualters, WG Tankersley, and SA Fry. 1984. A mortality study of men exposed to elemental mercury. Journal of Occupational Medicine 26:817-821.

Cragle DL, CM Shy, RJ Struba, and EJ Siff. 1985. A case-control study of colon cancer and water chlorination in North Carolina. In Proceedings of the 5th Conference on Water Chlorination: Environmental Impact and Health Effects, pp. 153-159. Published by Lewis Publishers, Inc., Chelsea, Michigan.

Dupree EA, DL Cragle, R McLain, and MJ Teta. 1987. Mortality among workers at a Uranium processing facility: Linde Air Products Company Ceramics Plant, 1943-1949. Scandinavian Journal of Work, Environment & Health 13:100-107.

Checkoway H, NE Pearce, DJ Crawford-Brown, and DL Cragle. 1988. Radiation doses and cause-specific mortality among workers at a nuclear materials fabrication plant. American Journal of Epidemiology 127:255-266.

Cragle DL, RW McLain, JR Qualters, JLS Hickey, GS Wilkinson, WG Tankersley, and CC Lushbaugh. 1988. Mortality among workers at a nuclear fuels production facility. American Journal of Industrial Medicine 14:379-401.

Gilbert ES, SA Fry, LD Wiggs, GL Voelz, DL Cragle, and GR Petersen. 1989. Analyses of combined data on workers at the Hanford Site, Oak Ridge National Laboratory, and Rocky Flats Nuclear Weapons Plants. Radiation Research 120:19-35.

Frome EL, DL Cragle, and RW McLain. 1990. Poisson regression analysis of the mortality among a cohort of World War II nuclear industry workers. Radiation Research 123:138-152.

Gilbert ES, SA Fry, LD Wiggs, GL Voelz, DL Cragle, and GR Petersen. 1990. Methods for analyzing combined data from studies of workers exposed to low doses of radiation. American Journal of Epidemiology 131:917-927.

Wing S, CM Shy, JL Wood, S Wolf, DL Cragle, and EL Frome. 1991. Mortality among workers at Oak Ridge National Laboratory: Evidence of radiation effects in follow-up through 1984. Journal of the American Medical Association 265:1397-1402.

Cragle DL and AM Fetcher. 1992. Risk factors associated with the classification of unspecified and/or unexplained causes of death in an occupational cohort. American Journal of Public Health 82:455-457.

Cragle DL, SM Wells, and WG Tankersley. 1992. A morbidity study of workers potentially exposed to epoxy resins, hardeners, and solvents. Journal of Applied Occupational and Environmental Hygiene 7:826-834.

Wing S, CM Shy, JL Wood, S Wolf, DL Cragle, W Tankersley, and EL Frome. 1993. Job factors, radiation and cancer mortality at Oak Ridge National Laboratory: Follow-up through 1984. American Journal of Industrial Medicine 23:265-279.

Gilbert, ES.DL Cragle, and LD Wiggs. 1993. Updated analyses of combined mortality data on workers at the Hanford Site, Oak Ridge National Laboratory, and Rocky Flats Weapons Plant. Radiation Research 136:408-421.

Wactawski-Wende J, RL Priore, DL Cookfair, and DL Cragle. 1995. Survival factors in cervical cancer patients alive 5-years after diagnosis. Submitted for consideration for publication to the Journal of Clinical Epidemiology.

Cragle, DL, JP Watkins, and K Robertson-DeMers. 1996. Mortality among workers at a nuclear fuels production facility: The Savannah River Site, 1952-1986. (submitted to Epidemiology)

Cragle, DL, JP Watkins, JN Ingle, K Robertson-DeMers, WG Tankersley, and CC West. 1996. Mortality among workers at a uranium processing facility: The Fernald Feed Materials Production Center, 1952-1989. (Submitted to Radiation Research)

Frome, EL, DL Cragle, JP Watkins, S Wing, C Shy, WG Tankersley, and CM West. 1996. A mortality study of employees of the nuclear industry in Oak Ridge, Tennessee. (Submitted to Radiation Research)

Wells, SM, DL Cragle, and WG Tankersley. 1995. An update of mortality among welders, including a group exposed to nickel oxides. (to be submitted)

Watkins, JP, JL Reagan, DL Cragle, EL Frome, CM West, D Crawford-Brown, and WG Tankersley. 1995. Collection, validation, and description of data for the Oak Ridge Nuclear Industry Mortality Study. (to be submitted)

CHAPTERS, REVIEW ARTICLES AND OTHER PUBLICATIONS:

Cragle DL. 1978. Masters thesis, Virginia Commonwealth University, Medical College of Virginia, Department of Human Genetics. Richmond, VA. A method for weighting to estimate gene frequencies in inbred populations.

Fry SA, DL Cragle, JR Qualters, and CC Lushbaugh. Feasibility of a mortality study of workers at nuclear power plants. EPRI Proj. RP2088-1, November 1983.

Cragle DL. 1984. Ph.D. dissertation, University of North Carolina, School of Public Health, Department of Epidemiology, Chapel Hill, NC. The effects of genetic and environmental interaction in an epidemiologic investigation of colon cancer and water quality.

Fry SA, CC Lushbaugh, CM Shy, DL Cragle, H Checkoway, SB Blum, AV Carpenter, EA Dupree, EL Frome, PG Groer, and J Wilson. 1985. The US Department of Energy health and mortality study: the Oak Ridge studies. In: Epidemiological Studies of Some Populations Exposed to Ionizing Radiation, (Weeks, JL, Compiler), pp. 18-40, Atomic Energy of Canada Limited, Pinawa, Manitoba, AECL-8360.

Flanders WD, DL Cragle, and JW McClanahan. 1985. Evaluation of non-worker residents as a comparison group in occupational studies of Oak Ridge workers. Oak Ridge Associated Universities Technical Report (ORAU-241).

Fry SA, AV Carpenter, DL Cragle, EA Dupree, PG Groer, CC Lushbaugh, H Checkoway, DJ Crawford-Brown, CM Shy, JE Watson, and EL Frome. 1988. Studies of mortality among populations of US nuclear industry workers. In Health effects of low dose ionizing radiation. BNES, London, Paper 14, pp.77-80.

Doll R, A Andersen, WC Cooper, I Cosmatos, DL Cragle, D Easton, P. Enterline, M Goldberg, L Metcalfe, T Norseth, J Peto, J-P Rigaut, R Roberts, SK Sielkop, H Shannon, F Speizer, FW Sunderman, Jr., P Thornhill, JS Warner, J Weglo, and M Wright. 1990. Report of the International Committee on Nickel Carcinogenesis in Man. Scandinavian Journal of Work, Environment & Health 16:1-82 (special issue).

Watkins, JP, JL Reagan, DL Cragle, EL Frome, CM West, DJ Crawford-Brown, and WG Tankersley. 1993. Data collection, validation, and description for the Oak Ridge nuclear facilities mortality study. Oak Ridge Institute for Science and Education technical report 93/J-42.

Watkins, JP, DL Cragle, EL Frome, CM West, DJ Crawford-Brown, and WG Tankersley. 1994. Adjusting external doses from the ORNL and Y-12 Facilities for the Oak Ridge Nuclear Facilities Mortality Study. Supplemental Report to ORISE 93/J-42. Oak Ridge Institute for Science and Education technical report 94/G-34.

Fry, SA, DL Cragle, DJ Crawford-Brown, EA Dupree, EL Frome, ES Gilbert, GR Petersen, CM Shy, WG Tankersley, GL Voelz, PW Wallace, JP Watkins, JE Watson Jr, and LD Wiggs. 1995. Health and mortality among contractor employees at U.S. Department of Energy facilities. IN: Radiation and Public Perception: Benefits and risks, edited by Jack P. Young and Rosalyn S. Yalow. American Chemical Society. pp.239-258.

COLLEGE LEVEL COURSES TAUGHT:

1993, 1994, 1995, 1996:	General Genetics, Pellissippi State Technical Community College
1993, 1995:	Introduction to Biology, Pellissippi State Technical Community College

Long Term Proposal Donna

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

April 22, 1996

Ruth Neta, Ph.D.
Senior Science Advisor
Office of International Health Programs
EN-63/GTN, 270-CC
Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Dr. Neta:

Enclosed is a copy of the Proposal for Physical Preservation of Existing Data for the Ural Research Center for Radiation Medicine (URCRM) which was sent to you by E-mail on Monday, April 22, 1996. Also enclosed are copies of Curriculum Vitaes for myself and my associate, Lisa Larmee, the Budget Request, and a copy of the hard-copy inventory prepared by Dr. Startsev.

If I can answer any questions for you concerning this proposal please call me at (423) 576-2866.

Sincerely,

Donna L. Cragle

Donna L. Cragle, Ph.D.
Director, Center for Epidemiologic Research

DLC:LAL:jj

Enclosures: As stated

c: R. Chung
Dr. G. Davis

Project 1.2

RISK ESTIMATION FOR THE DETERMINISTIC AND STOCHASTIC EXPOSURE EFFECTS AND THE RESULTS OF ACTUAL OBSERVATIONS OF THE POPULATION HEALTH IN THE REGION OF THE INDUSTRIAL ASSOCIATION "MAYAK"

Proposal for Physical Preservation of Existing Data

Russian Side:

Dr. Nikolai V. Starteev, Principal Investigator
Urals Research Center for Radiation Medicine

United States Side:

Donna L. Cragle

Dr. Donna L. Cragle, Principal Investigator
Oak Ridge Institute for Science and Education

TABLE OF CONTENTS

ABSTRACT

On January 14, 1994, the Government of the United States and the Government of the Russian Federation signed the "Agreement on Cooperation in Research on Radiation Effects for the Purpose of Minimization of Consequences of Radioactive Contamination on Health and the Environment". Under the auspices of this agreement, U.S. and Russian scientists will conduct joint collaborative environmental and epidemiologic research. The operation of the MAYAK Industrial Association in the Southern Ural mountains resulted in prolonged exposures to populations living in areas affected by normal plant operations and by releases from accidents. One of the projects approved under the Agreement was the development of a plan for physical preservation of existing hard copy data.

Hard copy documents that contained information regarding individual health evaluation conducted in a clinical setting began to be collected and compiled in the late 1950s. There are other supporting documents that detail individual dose measurements, addresses, causes of death (where appropriate) and many other data items necessary for epidemiologic studies that presently reside in hard copy files without the benefit of a duplicate copy. Because of the unique nature of the population exposures in the Urals, these documents need to be preserved in a permanent, accessible format. The following is a proposal for performing this preservation task.

1. INTRODUCTION

The Executive Committee of the Joint Coordinating Committee for Radiation Effects Research (JCCRER) identified and approved pilot projects to be implemented during the year following its first annual meeting in October 1994. Three projects were approved by the Executive Committee under Section 1.2 (Risk Estimation for the Deterministic and Stochastic Exposure Effects and the Results of Actual Observations of the Population Health in the Region of the Industrial Association "MAYAK"):

1. Physical preservation of existing data;

2. Evaluation of cancer mortality in relation to radiation exposure among persons living in the vicinity of the Techa River; and

3. Development of a long-term Russian-American collaborative epidemiologic program for studying the stochastic effects of environmental radiation exposure in populations living near the MAYAK Industrial Association.

This proposal is to recommend a systematic preservation of hard copy records at the Ural Research Center for Radiation Medicine (URCRM) for members of both the Techa River and EURT cohorts.

2. DATA ORGANIZATION AT URCRM

Radiation health effects data have been collected by URCRM on inhabitants exposed to radiation incidents in the Southern Ural region of the Russian Federation. Data sources were varied and included tax books, death certificates, outpatient visit records, and inpatient hospital admission records. A significant amount of the information from these sources has been entered into a computer data base; however, a substantial amount of information has not been entered and should be archived for use in future studies. A description of a recent records inventory performed by Dr. Startsev is included as an appendix to this document.

Hard Copy Data

All hard copy information at URCRM can be divided into four groups:

1. **Unique information (available only at URCRM):**

outpatient medical charts
case histories
tissue sample logs
myelogram registration logs
radiochemical and dosimetric measurements card files
leukemia patient card files

2. **Information for compiling registries collected by URCRM staff from different sources:**

Techa registry card files
EURT registry card files
oncological patient card files
oligophrenia, schizophrenia, epilepsy and Down's syndrome patient card files
card files for patients with congenital defects and inherited diseases
registries of twins of the Kurgan Region
census logs of resettled population (late 1960's-1970's)

3. **Registry information obtained from other organizations:**

photocopies of resettled population lists
photocopies of tax books

4. **Background information for follow-up of migration, mortality and birth rates:**

photocopied lists of people exposed to radiation (MAYAK and Techa incidents) who received exposed population certificates
handwritten copies and photocopies of death certificates
handwritten copies of birth certificates

Computer Files

URCRM staff have been entering data from the hard copy records into a computer for some time. For the Techa River cohort, records for 15 of the 30 villages included in the study have been entered. The computer data base used, the Unified Information Data Base (DB MAN), is a relational-type data base and contains several distinct files which are linked together by a unique identification number (systematic number). The registries currently on the DB MAN and their relationships are:

1. **Residence History File**

This file contains information on village code and duration and dates of residence in each village.

2. **Mortality File**

There is one file for exposed persons in registry and a separate file for nonexposed persons (controls). Information in each file includes date of birth, date of death, village code, and ICD-9 cause of death code.

3. **Diagnosis File**

The Diagnosis Registry contains information on dates of clinical examination(s), physician who performed the exam, and ICD-9 code for each diagnosis.

4. **Family History File**

This file contains information on vital status, date of last known vital status, and information on whether there is a copy of the death certificate in the file for all decedents. Approximately 90,415 persons are in this registry

5. **Cancer Morbidity File**

This file contains information on age, year of birth, gender, ethnic code, occupation, village code, day, month and year of cancer diagnosis, source of information of diagnosis, ICD-9 code, source of confirmation of diagnosis, information on treatment including X-ray therapy and chemotherapy, vital status, date of death (if deceased) and availability of death certificate. Through 1993, 1,780 cases of cancer have been diagnosed in the exposed group and 16,260 cases diagnosed among the unexposed group.

3. OBJECTIVE

The primary objective under Project Area 1.2a of the pilot project is the physical preservation of existing data for the Techa and EURT cohorts at URCRM. As outlined in Section 2, URCRM has collected a substantial amount of data concerning the radiation health effects on inhabitants exposed to radiation incidents in the Southern Ural region of the Russian Federation. Since these data will be used in future epidemiologic studies, an efficient, user-friendly, and effective system is needed for

archiving, storing, and updating the data. Recommendations are given in this proposal to aid URCRM in obtaining practical and productive ways to maintain these data. These recommendations are based on (1) frequency of use of each type of data; (2) probability new information will be added to each data type; (3) ability to replace each data type; and (4) current storage order of each type of data. Several other factors considered for these recommendations were data accessibility, data organization, facilities and equipment, current procedures of maintaining data, and document volume.

4. DOCUMENT MANAGEMENT

All considerations in developing a plan for the physical preservation of the existing data at URCRM can be grouped under the heading of "document management". Document management has been defined as a series of steps (copying, routing, updating, re-routing) a document is cycled through from the time it is created or received until filed. A more-effective way to create, store, locate, retrieve, and update documents has evolved with electronic document management systems (EDMS). EDMS consist of a variety of hardware components such as scanners, workstations, optical disks, printers, jukeboxes, controllers as well as software components such as application software, utility software, or specialized software. There are several steps in creating an EDMS that represent the contemporary life-cycle of a document: (1) creation (capture), (2) distribution (workflow), (3) storage and retrieval (indexing), (4) presentation (printing), (5) protection (security), and (6) retention and disposition (records management).

Document Capture

The crucial step in the contemporary document life cycle is the creation which begins with the capturing of a document. This process converts documents and images into digital images and index data. Documents and images can be inputted into a EDMS in one of four ways: (1) scanning, (2) fax-modem, (3) importing digital documents from word processors, electronic mail, etc., and (4) importing digital computer output from mainframes and network application servers. The majority of the work of creating a EDMS is in the capture stage so it is critical this "front-end" step is accurate. Typically, documents are sorted into batches of similar documents and then scanned.

Documents can be automatically separated within batches with separator sheets or with bar codes printed directly on the pages. The key steps to scanning large volumes of data such as the URCRM archive are:

1. **Image Quality.** The quality of a scanned document should be equal in readability to the original document. Most scanners offer contrast enhancements that automatically adjusts the contrast on individual documents line by line so scanned documents will look as good or better than the original.

2. **Capture Speed and Flexibility.** Scanner speeds vary with document complexity. Many scanners are equipped with accelerator boards that maintain processing speed while they provide compression of the document and image enhancement. Scanning speed also varies between scanners with an average speed of 40-50 pages per minute.

3. **Reliability.** Better scanners are capable of handling scrunched and rumpled papers as well as varying thickness through an automatic document feeder. Flat-bed scanners are designed to scan odd-sized, thin, fragile documents as well as bound documents..

Scanned documents must also be indexed for retrieval. This is usually done by entering text data into the database of the EDMS which forms a link with the document. Some key elements in indexing are: (1) document title; (2) document type; (3) keywords; and (4) retention period. This process usually occurs on "production stations" that include scanning and indexing workstations on a local-area network (LAN), metropolitan area network (MAN), or enterprise-wide network (WAN). Indexing can be automatically or manually performed. To be performed automatically, image processing such as OCR or ICR and bar code recognition are required (could be done by putting the bar code for identification on document).

Image and Index Storage Management

After documents (images) and index data have been captured, the next step in forming an EDMS is the storage of the images as files on an optical-disk storage system and the indices in a relational database on a magnetic-disk storage system. There are many software applications

available to achieve this many of which follow a user-friendly graphical interface which provides a file room environment with icons of file cabinets, drawers, and folders.

Image and Data Retrieval

Since database applications are typically the core of an EDMS, the retrieval process of images and indices is achieved through database-type queries. These queries are usually based on manually-entered indices or automatically-entered indices.

Image and Data Viewing

Built-in document image viewer software in an EDMS allows users to view and retrieve documents. Typically this software will also allow users to do image annotation such as highlighting.

Image and Data Workflow and Output

Most EDMS have flexible routing or distributing features (workflow) through electronic mail, fax-modem, CD-ROM, and printers.

5. STORAGE RECOMMENDATIONS FOR URCRM'S ARCHIVAL

The hard copy records that make up the URCRM archive are described below with recommendations for preservation using a EDMS:

Group I Information

Inpatient and outpatient medical records: These records are frequently used when patients are seen in the clinic or when they are admitted to the hospital. The physician needs to be able to retrieve the whole chart when the patient is seen. New data will be added to the charts as a result of clinic visits or hospitalizations. Some of the records are for people who are deceased and these records will not have any new data added.

Recommendation: Capture all inpatient and outpatient medical records through scanning into an EDMS and index records by ID, name, address, and passport data. Since no new data will be added to the records of deceased people, a CD-ROM

optical disk will be efficient for storage. A rewritable optical disk should be used for storage for the records of living patients since new data will likely be added.

Registers for data of cytological-morphological studies: These are running logbooks, in chronological order, that need to be used only when it is necessary for comparison.

Recommendation: Scan logbooks and index in chronological order. Store logbook images on a CD-ROM for reference.

Card files containing data of radiochemical and dosimetric measurements: All the data from these card files are in computer files and copies of each individual measurement may also be found in the patient's medical chart. The card file is no longer being updated because of direct computer entry of results. These cards are housed in fireproof cabinets because of their historical interest. The data were computerized in the mid-1980s and both visual checks and double entry were used to ensure accuracy in the files.

Recommendation: Because of their historic value these cards should be scanned, indexed, and stored on a CD-ROM. Updating the computer files of these cards should continue for future integration with EDMS application software.

Card file of leukemia patients: This file was constructed by Dr. Mira Kossenko and would be time-consuming to reconstruct if it was lost. The file contains blood counts, whole body counts, date and cause of death (if applicable) and cumulative dose data. These cards are not part of the database, but are of historical interest.

Recommendation: These cards should be scanned into an EDMS, indexed, and stored on a CD-ROM.

Group II Information

Techa registry card file, and EURT registry card file: These card registries were used to compile the rosters of exposed people in each cohort. They are of historical interest, but all information contained on the cards is in computer files. The cards are frequently used but will not be used at all when the registry is completed.

Recommendation: The computer files of this card file should continue to be updated for future integration with EDMS application softwares; however, the cards should be scanned and stored on a CD-ROM because of their historic value.

Oligophrenia registry, Down Syndrome registry, and twin registry: Five years ago psychiatric problems started to be considered. These data were collected on different cards for the Chelyabinsk oblast if the patient had a systemic number (i.e., was part of one of the exposed cohorts). A computer file exists with these data. The file was created and maintained by the person who was interested in the particular outcome and they may be discontinued. No formalized data checks have been done on these files.

Recommendation: The computer files of this card file should continue to be updated for future EDMS application software; however, the cards should be scanned and stored on a CD-ROM.

Group III Information

Resettled population census books (second half of the 1960s and 1970s, copies of resettled population lists, and copies of tax books: These are the primary sources used to establish the exposed cohorts. They are of historical interest and were used for verification of the registries.

Recommendation: These census books should be scanned, indexed, and stored on a CD-ROM.

Group IV Information

Death certificates: These are hand copies of death certificates for the early years and photocopies for the later years of follow-up. They are organized by region, settlement, and systemic number for people who are part of the exposed cohorts.

Recommendation: These documents should be scanned, indexed by region, settlement, and systemic number, and stored on a CD-ROM.

Benefit affidavits: These are used to derive current residence for people who are still living. Addresses are updated in the computer files.

Recommendation: No need to image these records.

Birth certificates: These provide the place and date of birth for persons who comprise the second generation of exposed people (i.e., offspring of the exposed cohort members).

Recommendation: These birth certificates should be scanned, indexed, and stored on a CD-ROM.

6. IMAGING BENEFITS

Imaging documents through an EDMS has many advantages and benefits:

- fast retrieval
- improved information access
- good image quality
- documents always available, never misfiled
- integration with existing systems
- reduced labor costs
- lower operating costs
- increased productivity

In particular to URCRM, an EDMS would capture, index, cross-reference, and store valuable data for present and future epidemiologic studies. Having all archival data stored on CD-ROM optical disks will give URCRM convenient, fast, accurate ways of retrieving valuable information. Other benefits an EDMS would give to URCRM are:

- Inventory of all data
- Detailed patient history
- Integration of other patient medical reports such as pathology reports
- Allows additional storage for future archival information
- Can be used as a "from this day forward" document collection
- URCRM's current software can be integrated with EDMS softwares
- Prevents wear and tear on the irreplaceable source documents

Imaging reduces overall operating costs by eliminating costs of copying, distributing, and storing hard copy documents. Imaging also strengthens accuracy by ensuring all information on a document is captured; data are not inadvertently left out. Physicians and researchers at URCRM

could have a comprehensive, "electronic library" of patient histories, death certificates, tax books, and logbooks accessible within seconds. Outlying clinics could scan new medical record data for cohort members and transmit the new documents electronically. URCRM's existing software could be image-enabled which will allow improved quality, speed, and productivity as well as making existing software applications more valuable to more staff. Application software will allow URCRM to access and compile data that would normally take a significant amount of time to collect. Employee productivity is also improved through imaging by ensuring data is readily available when needed. Documents are never lost or misfiled preventing loss of data and time spent looking for missing files.

7. CONCLUSIONS

Imaging is becoming a mainstream technology and is quickly being recognized as a basic requirement to any document-intensive organization. Implementing an EDMS at URCRM would provide better quality documents, more efficient processing, versatility, growth, and flexibility. With the appropriate EDMS, URCRM could have a state-of-the-art document management system that will allow their staff a quick and reliable accessibility to information ("backfile" and "this day forward") needed for research and to provide the most accurate diagnosis and treatments for their patients. This system will allow for permanent preservation of the valuable, irreplaceable epidemiologic data set that has been compiled by URCRM.

8. ESTIMATED COSTS

	Year 1	Year 2	Year 3
Software	$30,000		
Hardware	$93,700	$7,666	$8,966
Labor (4% increase per year)	$27,900	$29,016	$30,177
Taxes (79% of salary; required by Russian Law)	$22,041	$22,923	$23,840
Training	$5,000		
Mail, telephone, fax	,600	,600	,600
Travel	$6,000	$6,000	$6,000
Institutional Overhead (40% of salary)	$11,160	$11,606	$12,071
Total	$196,401	$77,811	$81,654
Taxes (25.6% of Total; required by Russian Law)	$50,279	$19,929	$20,903
Total Costs	$246,680	$97,731	$102,557

APPENDIX: URCRM HARD COPY INFORMATION INVENTORY

URALS RESEARCH CENTER FOR RADIATION MEDICINE (URCRM)
HARD COPY INFORMATION INVENTORY

1. Archive Contents

The Urals Research Center for Information Radiation Medicine (URCRM) has collected radiation health effects data on inhabitants exposed to radiation incidents in the Southern Urals region of the Russian Federation. In particularly, disease incidence, birth and mortality rates of exposed individuals were sporadically collected within different scientific and practical projects; therefore, its completeness varies. For example, death certificates were collected through 1992 for five districts of the Chelyabinsk Region affected by radiation incidents. For two districts of the Kurgan Region, death certificates were available only to 1982. Practically all birth certificates have been collected for children born to parents who were exposed to radiation from the Techa contamination who remained in the Chelyabinsk Region. Data for those exposed to radiation from the 1957 East Urals Radioactive Trace (EURT) are available to 1988. All hard copy information available at URCRM can be divided into one of the four groups listed below.

1. Unique information (only available at URCRM)

- outpatient medical charts
- case histories
- tissue sample logs
- myelogram registration logs
- radiochemical and dosimetric measurements card files
- leukemia patient card files

2. Information for compiling registries collected by URCRM staff from different sources

- Techa registry card files
- EURT registry card files
- oncological patient card files
- oligophrenia, schizophrenia, epilepsy and Down's syndrome patient card files
- card files for patients with congenital defects and inherited diseases
- registries of twins of the Kurgan Region
- census logs of resettled population (late 1960's-1970's)

3. Registry information obtained from other organizations

- photocopies of resettled population lists
- photocopies of tax books

4. Background information for follow-up of migration, mortality and birth rates

- photocopied lists of people exposed to radiation (Mayak and Techa incidents) who received exposed population certificates
- handwritten copies and photocopies of death certificates
- handwritten copies of birth certificates

Table 1 (page 3) summarizes the documents that form the URCRM archive.

An additional 4,000 photocopies of death certificates between 1983-1988 for two districts of the Kurgan Region were added to the URCRM archive. Also, 22 tax books archived in the Casley Regional Archive were photocopied. Lists of people who received exposed population certificates from social protection centers of five districts of the Chelyabinsk Region, seven metropolitan districts of the city of Chelyabinsk and regional social protection centers of the Chelyabinsk and Kurgan regions were also photocopied.

1.2 Description of Archival Document Information Outpatient Charts

Two types of outpatient charts included are individual outpatient charts (25 208 x 152 mm sheets), and a medical book (130 248 x 168 mm sheets). The cover sheet contains the patient's systemic number, last and first names and patronymic names, dates of birth, place of major exposure and current address. (Occasionally whole body counter measurement results are also included.) Doctor and other specialists record any changes on the charts while results of laboratory analyses and counts are attached to the chart.

Table 1. Documents Forming the URCRM Archive

Number	Description	Quantity
1	Outpatient charts including: EURT cohort Techa cohort Hematological Miscellaneous	
2	Case histories (folders)	13,638
3	Tissue sample logs	9
4	Myelogram registration logs	7
5	Lifetime radiochemical and dosimetric measurements cards	~12,500
6	Card file for leukemia and chronic radiation sickness patients	~300
7	Techa registry cards	65,000
8	EURT registry cards	4,651
9	Oncological patients cards	17,100
10	Cards for oligophrenia, schizophrenia, epilepsy and Down's syndrome patients	3,976
11	Cards for patients with congenital defects and hereditary diseases	750
12	Kurgan Region twins registry (cards)	819
13	Census logs of villages with resettled populations	052
14	Photocopies of tax books	022
15	Photocopies of the following lists: - resettled population (according to Mayak data) - children in orphanages - prospecting parties	 1,392 1,419 1,166
16	Handwritten copies and photocopies of death certificates for Chelyabinsk Region (Argayash, Krasnoarmeisk, Kunashak and Sosnovka Districts) and for Kurgan Region (Dolmatov and Kataisk Districts)	~107,000
17	Photocopied lists of people exposed to radiation (Mayak and Techa incidents) who received exposed population certificates	3,100
18	Handwritten copies of birth certificates	4,100

A formalized outpatient chart (FOC) contains the patient's passport data, place and dates of major exposure, previous addresses, current address, family history, diagnosis, and indexes of medical examinations. The outpatient charts are ordered by major exposure villages and within the villages by systemic numbers.

Case History for Hospital Patients

Case histories are stored in 315 x 235 mm folders. The title page of the folders includes the archival number, the systemic number, andlast, first and patronymic names. Case histories are enclosed on 36 sheets (293 x 210 mm, 20 mm thick). The title page of each case history has an archival number, annual registration number, last, first and patronymic names, date of birth and sometimes a current address. Also included in the case history are admittance and discharge dates passport data, initial and final diagnoses, analysis and objective examination results, prescriptions, epicrisis, and the doctor in charge.

Tissue Sample Logs

There are two sizes of tissue sample logs: (1) 125 sheets (295 x 200 mm), and (2) 60 sheets (375 x 275 mm). The log is designed for registration of osseous and hematopoietic tissues and trepanobiopsy. Included in this log are ordinal numbers, the patient's last, first and patronymic names, date of birth, systemic number, addresses (if available), date of sampling, preparation number and the analysis result.

Myelogram Registration Log

The myelogram registration logs are in three sizes: (1) 500 sheets (210 x 294 mm); (2) 125 sheets (295 x 200 mm); and (3) 125 sheets (280 x 205 mm). These logs include ordinal number

(general and from the beginning of the year), sampling dates, last, first and patronymic names, systemic number (if in the exposed population inventory), the year of birth, and analysis results.

Life-Time Radiochemical and Dosimetric Measurements Card File

This card file contains 210 x 150 mm cards which include the systemic number, last, first and patronymic names, date of birth, gender, place and time of major exposure, date and results of whole-body counter measurements (^{137}Cs, ^{40}K, and ^{90}Sr count in the whole body), forehead sensor measurement results, and ^{90}Sr count in teeth. If radiochemical analysis of excretions was done, the type, the date of sampling and the analysis result are given.

Card File for Leukemia and Chronic Radiation Sickness Patients

This card file is composed of 210 x 150 mm cards that includes last, first and patronymic names, systemic number, and place and time of major exposure. Occasionally, a relative's name and address may be given. Additional information listed on each card are last address, diagnosing year, year the patient's name was removed from the registry, blood count results, and whole body counter measurement results. If the person is dead of death, cause of death, and radiation dose are shown.

Techa Registry Card File

The Techa registry card file is composed of 124 x 74 mm cards. Recorded in the toop, left-hand corner are the last, first and patronymic names, closest relatives (mother, father and spouse) and their exposure locations corner. In the top, right-hand corner, the patient's former residences are shown by the year and place of major exposure and the year the patient was resettled or moved. The last entry is the patient's current address. The patient's date of birth and systemic number (in red ink) are written at the top center of the card. Information on the outpatient-patient medical examinations

and the whole body counter measurements with their respective dates are given in the bottom left-hand corner.

EURT Registry Card File

This card file is composed of individual 206 x 147 mm cards. The front top center contains the name of the settlement and the family number. The years the family lived in the village, taken from tax books, are written in pencil the top, right-hand corner. All the family members are listed on the card beginning with the head of the family with their date of births and dates of death. The availability of the death certificate is shown and the coded cause of death (according to International Classification of Diseases, Revision 9 - ICD-9). If a family member (or the entire family) moved to another village, the name of the new village and the year moved in, are also shown.

Card File for Oncological Patients

The oncological patient card file is composed of individual 125 x 75 mm cards. Shown on the front of the card are last, first and patronymic names, systemic number (if the patient is part of an exposed population registry), diagnosis date, the diagnosis, vital status, and address.

Card File of Oligophrenia, Schizophrenia, Epilepsy and Down's Syndrome Patients

The above card file is composed of individual 190 x 80 mm cards (for oligophrenia and schizophrenia patients) and 95 x 80 mm cards (for patients with Down's syndrome). The front of each card includes the last, first and patronymic names, year of birth, systemic number (if included in the registry of exposed people), address, diagnosis, obstetrical history, parental information (their last, first and patronymic names and years of birth).

Card File of Patients with Congenital Defects and Hereditary Diseases

This card file is composed of individual 95 x 80 mm cards. The front of the card shows last, first and patronymic names, year and place of birth, systemic number (if on the registry of exposed population), parents' passport data, any diagnosis and medical examination results.

Kurgan Region Twin Registry

The Kurgan Region Twin Registry consists of 205 x 150 mm cards. The front of the card includes the last, first and patronymic names of each twin, dates of birth, information about the parents including their systemic numbers (if in the registry of exposed population) and the place of major exposure.

Census Log

The census log is a 125 page (207 x 300 mm) book. The title page includes the name of the village and the ordinal number. The population is listed by families with the head of the family noted and how other family members are related. Date of birth, previous addresses, current address and information about relocation are also shown in the census log. (Few logs contain alphabetized entries.)

Photocopies of Tax Books

These tax books were photocopied on 210 x 297 mm paper then bound into books. Labels show the name of the village, census year, streets and the district archive in which the book was photocopied. The first page is a photocopy of the original title page of where the village or the village council is shown, years of completing the book, the ordinal number originally assigned in the village in the year the census was started, and the street where the census was taken. Each photocopy contains information about the head of the family and all the family members with their last, first and

patronymic names, date of birth, date of death, ethnic identity, education, social status, moving information, military service, and education.

Resettled Population List (Techa Contamination)

This list is formatted on 302 x 222 mm paper. On the title page, villages are listed by districts and regions. Each entry has an ordinal number, the resettled person's last, first and patronymic names, and number of family members. The amount of monetary compensation, the availability and place of archiving the estimated value of the family personal belongings are also included.

Resettled Population List (MAYAK Accident)

Formatted on 306 x 222 mm paper, this list shows settlements on the title page by districts and regions. Each entry has an ordinal number, last, first and patronymic names of the resettled person, year of birth, job affiliation and position at the time of resettlement, availability and place of archiving of the estimated value of the family and personal belongings.

List of Children in Orphanages

On 295 x 210 mm paper, this list shows the name of the orphanage and the year the list was compiled on the title page. The list also shows last, first and patronymic name, year a child moved to an orphanage, when a child was moved, and the name of the new orphanage.

Copies of Death Certificates

There are two types of death certificate copies: handwritten and photocopies. There are four types of handwritten copies of death certificates:

1. Formatted on 150 x 150 mm paper these death certificates include ordinal or systemic number (if the patient's name is in the registry of exposed population), last, first and patronymic names, date, cause and coded cause of

death, last address (if there is a systemic number, the place of major exposure), a doctor's or paramedic's statement, and informant.

2. These death certificates are formatted on 210 x 145 mm paper and include the ordinal or systemic number (if the patient's name is included in the registry of exposed population), last, first and patronymic names, date of birth, date of and death, gender, systemic number, place of major exposure, place of death, informant (autopsy record, death certificate, and so forth), cause of death, and coded diagnosis.

3. Formatted on 300 x 220 mm paper these death certificates contain ordinal or systemic number (if the patient is included in the exposed population registry), last, first and patronymic names, date of birth, date of death, gender, and if there is a systemic number, places of major exposure, place of birth, place of death, education, employment, sources of information (autopsy record, death certificate or other), the cause of death, coded diagnosis, and informant.

4. These dearth certificates are formatted on 190 x 805 mm paper that include systemic number (if the patient is included in the exposed population registry), last, first and patronymic names, date of death, cause of death, coded cause of death, and the last address.

Photocopies of death certificates are on 210 x 297 mm sheets. Each photocopy contains the ordinal number, last, first and patronymic names, ethnic identity, date, place and cause of death, date and place of birth, place of permanent residency, marital status, job affiliation and profession, education, death statement, the informant's last, first and patronymic names and address.

Exposed Population Certificate List

Photocopies are made on 210 x 297 mm paper. The seal of the district administration head where exposed population certificates were issued is imprinted on the top right-hand corner along with his signature and the date. The name of the village in which the patient lived at the time of the accident is shown in the middle of the page. The list contains last, first and patronymic names, date of birth, the period lived in the village and evacuation period, the certificate serial number and date of issue, on what basis it was issued, current address and signature. Shown at the end of each list is

the seal of the manager of the social protection center and his signature along with the signature of a specialist of the same center where the certificate was issued.

Birth Certificate Copies

Copies of birth certificates are individual handwritten cards (190 x 80 mm). Each card has the last, first and patronymic names, place and date of birth, last, first and patronymic names of the patient's father and mother with their systemic numbers.

1.2 Sources for Updating Information

The information system is updated when a patient visits the outpatient department of the URCRM. The receptionist asks the patient about his passport data, when he lived on the Techa, his current address, education, job affiliation, job exposure, and risk factors. The patient is also asked about family history (parents, siblings, spouse and children). An FOC is completed as a result and if the information has already been entered, it is verified and updated. An oncological screening form is also completed.

The patient is then analyzed in the clinical laboratory where he also undergoes measurements by the whole body counter. Women are required to see a gynecologist for an examination. The gynecologist then completes the pertinent sections of the FOC (gynecological status, pregnancy and child birth) and the oncological screening form. The patient is also examined by another doctor who enters the diagnosis on the FOC diagnosis section. If the patient is hospitalized, the doctor in charge completes this section.

Medical examinations of the populations of the five districts of the Chelyabinsk Region and the two districts of the Kurgan Region are regularly completed by URCRM staff. Queries, similar to those used when the patient visits the outpatient department, are also completed during these

examinations. Information, therefore, is annually updated for ~4,000 people because of visits to the outpatient department and through local medical examinations.

To follow global indexes as migration, death and birth rates, it was decided information will be collected regularly through regional addresses and ZAGS offices. Another source of information are tax books for villages whose population was evacuated. In addition, a 1994 law was enacted on the social protection of radiation-exposed population because of an accident at PA MAYAK and on account of a radioactive release into the Techa. Because of this law, issuing certificates to exposed populations began.

The criteria for determining what populations would receive these certificates is described below.

Chelyabinsk Region

1. People presently living in villages of the five exposed districts (in district social protection offices).

2. People presently living in the city of Chelyabinsk (in seven metropolitan district social protection offices of Chelyabinsk).

3. People who lived in the contaminated area of the Chelyabinsk Region and who presently live in other districts and towns of the Chelyabinsk Region and outside the Chelyabinsk Region (in the regional protection office).

Kurgan Region

1. People who lived in the contaminated area of the Kurgan Region (in the regional office of social protection).

Sverdlovsk Region

1. People who lived in the EURT evacuated villages (in the EURT Administration).

After evaluating our resources and the significance of the information collected for research and practical activities carried out by other departments of URCRM, we collected the following information.

Migration

Lists of people who received exposed population certificates (Techa or Mayak incidents) were photocopied in the respective offices of the Chelyabinsk and Kurgan Regions. An electronic copy of such lists was received from the Sverdlovsk Region.

Mortality Rate

Death certificates for the years 1983-1989 were photocopied for two contaminated districts of the Kurgan Region.

Refining EURT Registry

Tax books for villages exposed to the 1957 radiation release (stored in the Casley archive) have been photocopied.

2. Completion and Corrections of the Data Base

2.1 Brief Description of the Data Base

Currently, there is a Unified Information Data Base (DB MAN) available. The DB MAN is a relational type data base and it consists of individual indexed relations integrated through relatonships from primary and secondary keys. The main keys, which relate the registries, are systemic numbers. The systemic numbers are unique and have error protection coding. For example, if a patient is assigned a wrong systemic number (the same person is assigned two different systemic

numbers and is listed twice) and the error is detected, one number is permanently deleted. (The DB MAN registries and their relationships are shown in Figure 1.)

Identification Registry

The Identification Registry is the core of the DB MAN. It contains a set of attributes characterizing each individual and its association with radiation situations on the Techa and in the EURT area.

Strontium Registry

The results of the ^{90}Sr measurements in the whole body, teeth, frontal bone, and urine are stored in the Strontium Registry.

Diagnosis Registry

The Diagnosis Registry was formed based on the results of many years of medical examinations.

Family History Registry

The Family History Registry includes information from tax books and FOCs arranged by family cells. This registry is necessary for evaluating individual dose loads by the method of "family ecology" and for estimating genetic risk. It includes systemic numbers, relationship codes, and the systemic number of a relative. The registry is supplied with a program of data entry analysis. For example, if entry of a child's first or patronymic name is incorrect, the computer alerts the user.

Dead People Registry

This registry includes first and last names, date of birth, date of death, place of death, and cause of death for five districts of the Chelyabinsk Region (Argayash, Casley, Krasnoarmeysk, Kunashak, and Sosnovka) and two districts of the Kurgan Region (Dolmatov and Kataisk). It also contains information for the people exposed to radiation because of the Techa contamination and the 1957 accidents, and the control group (people who were not exposed to radiation in these incidents but lived in those districts).

Other Information

Besides the main registries the computer data base includes the following information:

- cancer registry
- peripheric blood count
- biochemical blood count
- immunological data
- neurological status
- physical development
- everyday life risk factors
- occupational risk factors
- job affiliation
- gynecological history
- pregnancy history
- therapeutic status

2.2 Completion and Correction of Data Base

Identification Registry

As part of this project, all of the registry information (except the current address) was verified and corrected using reference books of first and last names and settlements that made it possible to maintain random error protection. This was possible because of a new computer program called "Patient Identification" which was developed with an ongoing project of the URCRM Biophysical Laboratory entitled "Improvement of the Unified Information System "Radiation Situation and Population Health in the Area of PA Mayak."

Code reference manuals are presently used for data entry control. This eliminates data entry errors and their redundancy, therefore, speeding up data entry. It also ensures information reliability and eliminates inconsistencies. When encountering the problem of reading the person's last and first names (especially if the person is a Tartar or a Bashkir), the operator can use the reference book and enter the verified information in the registry. The code reference book of exposed settlements makes it possible to enter information for only seven districts under investigation. Such lines as status, status year and cohort are protected from arbitrary entry by the following phrases: alive because somebody said so, dead because somebody said so, or dead with a certificate. The date of the end of the period a person lived in a village is limited by the year of relocation. For example, if the person lived in Metlino, the reference value list "will not allow" to record any year following 1956.

Strontium Registry

Information for this registry is entered, checked and corrected by the staff of the URCRM Biophysical Laboratory. To do this, a computer program, "Whole Body Counter Operator," was developed.

Diagnosis Registry

The URCRM Epidemiologic Department is responsible for diagnosis coding, data entry and correction. To do this work, a computer program "Diagnosis" was developed. Information for this registry is taken from all outpatient cards of the URCRM reception office by the diagnoses shown. The diagnosis reference book is a computerized version of the International Classification of Diseases, Revision 9 (ICD-9).

This registry has information for all people born in 1949 and prior for all the villages of the Chelyabinsk Region being studied. Information for progeny is introduced for Asanovo, Ibragimovo, Isayevo, Kurmanovo, S. Taskino, Metlino, Muslumovo, Nadirov Most, Nadirovka, and Techa-Brod.

Family History Registry

Three URCRM subdivisions are responsible for data entry, its checking and introducing corrections:

1. DB Information Support Group
2. Biophysical Laboratory
3. Epidemiologic Department

A computer program "Genealogy" was developed in the URCRM Biophysical Laboratory to support this task for the ongoing project "Improvement of the Unified Information System Radiation Situation and Population Health in the Area of PA Mayak." Information is added to this registry from archival materials (outpatient charts, the Techa Registry card file, and the EURT Registry card file). Information is introduced by settlements where the patient was exposed to radiation. This registry has been completed for the following settlements: Asanovo, Gerasimovka, Ibragimovo, Isayevo, S.

Taskino, Metlino, Muslumovo, Muslumovo (railway station), Nadirov Most, Nadirovka, Osolodka, Panovo, Geologorazvedka, Techa-Brod, and Cherepanovo.

Death Registry

The Data Base Information Support Group and Epidemiologic Department staff are responsible for coding causes of death, data entry and introducing corrections. There is a computer program entitled "Patient Identification" for this purpose. The verification of the dead people registry has been started. Verification of 81% (12,222 cases) of the population exposed to radiation on the Techa (Techa Registry) has been completed.

Other Information

The computerized data base has a 12-file structure (see Section 2.1). The information (except the Cancer Registry) is updated from FOCs in a semiautomatic mode when the patient visits the URCRM Outpatient Department. The Cancer Registry includes information on 18,057 patients of the Chelyabinsk and Kurgan regions obtained from the regional oncological centers (first and last names, date of birth and date of diagnosing the tumor and its type). It is updated by the Epidemiologic Department staff in a semiautomatic mode.

2.3 Computerized Data Base Status (through December 1995)

Information on the main registries of the data base is summarized in Table 2. The registries were completed (Section 2.2) and all available data (passport and residence information) have been included in the Identification Registry. The current address information is 80% complete. The Strontium Registry (100% complete) is automatically updated when the patient undergoes dosimetric measurements. The Family History Registry is 44% complete while the completeness of the

"Diagnosis" and the "Dead People" registries have not been determined. Information transfer from archival documents to the Registry Diagnosis has not been completed. Not all death certificates (Death Registry) have been collected for two districts of the Kurgan Region (since 1983) and for the Chelyabinsk Region (since 1993). (Table 3 contains modification information introduced into the data base other files.)

Table 2. Status of the Main Registries

No.	Registry	Number of Records	Percent Verified
1	Identification:		
	- passport data	90,945	100
	- places of exposure	87,974	100
	- last address	58,355	not verified
2	Strontium	53,475	100
3	Diagnosis	160,789	100
4	Family History	39,544	100
5	All deceased including:	110,675	
	- Techa Registry	15,029	81
	- EURT Registry	4,542	not verified

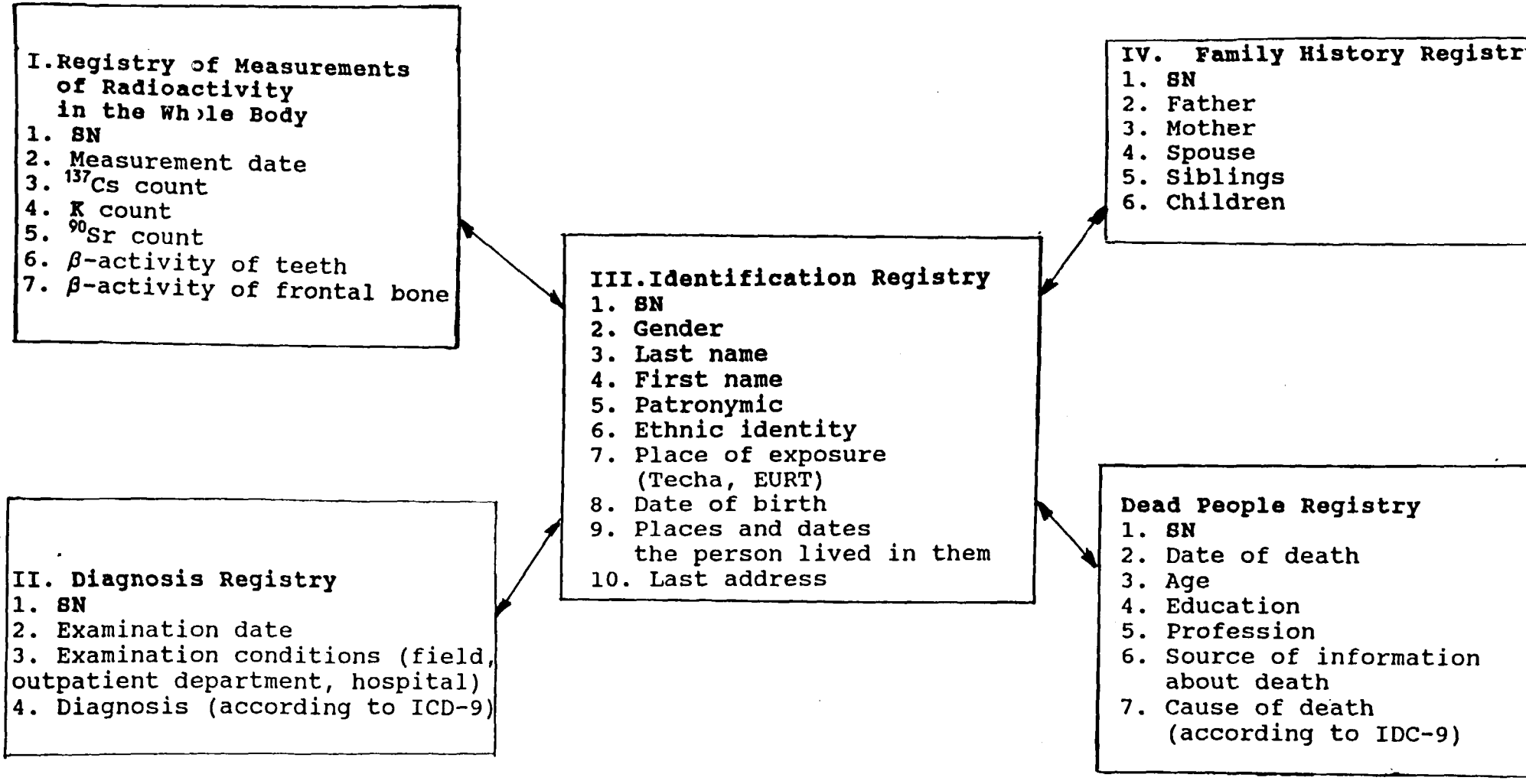
Since death certificates were no longer collected for two districts of the Kurgan Region, there is a sharp decrease in death information in the Techa cohort (Figure 3). Photocopying of death certificates organized in the Kurgan Regional ZAGS will allow more accurate information. Organizing death certificate collection for the Chelyabinsk Region beginning with 1993 and every year after is also necessary. As mentioned above, we are planning to organize a regular collection of mortality data from regional ZAGS archives. Figures 3 and 4 show that a significant amount of death information was obtained from relatives that create problems in correlating risk of death with

exposure level. We are planning, therefore, to search for death certificates of deceased individuals whose relatives have verified are dead.

Table 3. Amount of Information in Data Base Other Files

Number	Records	Number of Records		Amount of Data Changes for Two Years
		Dec. 1993	Dec. 1995	
1	Cancer Registry	13,940	18,057	4,117
2	Peripheral blood count	45,013	50,427	5,414
3	Biochemical blood count	4,538	4,538	0
4	Immunological data	621	1,906	1,285
5	Neurological status	4,693	7,383	2,690
6	Physical development	17,730	17,732	2
7	Risk factors: Everyday life	11,050	11,444	394
8	Occupational	10,114	12,302	319
9	Job affiliation	12,302	10,433	301
10	Gynecological status	930	6,577	0
11	Pregnancy history	6,577	12,603	0
12	Therapeutic status	7,351	930	258
			6,577	
			7,609	

Data Base MAN



Budget Request Format for EH-63 Funded Projects

Project/Subproject Title: 1.2a		**Period of Support:** Jul 1996-Jun 1999	
Physical Preservation of Existing Data			
Institution: Urals Research Center for Radiation Medicine			
Complete Address:			
Chelyabinsk, Russia			
		Telephone #:	**Fax #:**
Name of Principal Investigator:			
Dr. Nikola V. Startsev			
Name of Contact Person:			
Dr. Donna L. Cragle		(423)576-2866	(423)576-9557
Requested Items			
A. Equipment (itemize)			
Please list description of equipment	Optical disks	$8,000.00	**Amount in U.S. $$**
Personal computers	Hard disk or		$$ 15,000.00
Scanners	Redundant Array	$16,132.00	$$ 30,000.00
CD-Reader	of Inexpensive Disks		$$ 1,200.00
Juke box	(RAID)		$$ 40,000.00
Please justify equipment purchase on separate page(s)		**Subtotal>**	$$ 110,332.00
B. Supplies (itemize)			**Amount in U.S. $$**
Software			$$ 30,000.00
			$$
			$$
			$$
Please justify supplies on separate page(s)		**Subtotal>**	$$ 30,000.00
C. Estimated Travel Costs	**Destination**	**Travel Dates**	**Amount in U.S. $$**
Please list names of travellers			$$
Dr. Nikolai V. Startsev 3 trips	United States	Annually	$$ 18,000.00
			$$
			$$
			$$
Please report justification for travel on separate page(s)		**Subtotal>**	$$ 18,000.00
D. Personnel and Other Costs			
D. i) Project Personnel Costs	**Percent Effort**		**Amount in U.S. $$**
Please list names of staff members			$$
Dr. Nikolai V. Startsev	25%		$$ 4,433.00
Engineer	20%		$$ 2,747.00
Technical Personnel (8)	100%		$$ 79,913.00
Taxes on salary	79%		$$ 68,804.00
Please list duties of each staff on separate pages(s)		**Subtotal>**	$$ 155,897.00
D.ii) Indirect and or other costs			**Amount in U.S. $$**
Training			$$ 5,000.00
Other Costs			$$ 1,800.00
Institutional overhead (40% on salary)			$$ 34,837.00
Taxes (25.6%)			$$ 91,102.00
Please itemize these costs with explanations for each cost		**Subtotal>**	$$ 132,739.00
Taxes (25.6%)		**Total Costs**	$$ 446,968.00
E. Other Sources of Funding			
Project Title(s):			
Source of Funds:			
Percent effort of each project staff listed above			